Installing Aerial Cable Where Open-Wire or Underground Service Cannot Be Used—Handling Terminal Freight with Battery Trucks and the Usual Engineering and Operating Departments

Electrical World

New York, April 14, 1917 McGraw-Hill Publishing Co., Inc. Vol. 69, No. 15 10c a copy

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Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by the McGraw-Hill Publishing Company, Inc.

Vol. 69 NEW YORK, SATURDAY, APRIL 14, 1917 No. 15

The Engineer's Duty in War

THE die is cast and the United States now confronts the gravest situation since the Civil War. From now on it is swords out and strike home until we have a world peace founded on liberty and justice which shall give to coming generations freedom from the horrors of war. No man now can say how formidable or how long will be the combat before the inevitable end comes. Certainly no nation, however ferociously military, can withstand practically single-handed the gathered powers of the rest of the world. Whether the struggle lasts one year or five, it will fundamentally turn on the mustering of industries as well as of fighting men, on the organized skill behind the firing lines as much as upon the heroism of those who form them. It will be peculiarly a war of swiftly developed resources, of rapid gathering of material, of vast engineering skill and ability, and it is to this end that the country calls for the patriotic service of the whole engineering profession to forge the thunderbolts which shall be launched against the enemy. This is no time for half measures. We have lived in a fool's paradise too long. No ocean now guards us, but the fighting ships on it, the batteries that line its shores, and the mustered men who stand ready to strike down every foe within or without. The trumpet has sounded; the hour for waiting has passed.

Electric Trucks for Freight Terminals

NO greater opportunity for electric vehicle application exists than that afforded by freight terminals. If the moment freight arrived it were put on an electric truck and taken to a warehouse or delivered, the vexing and pressing problem of car shortage which now confronts the manufacturers of this country would be solved. Remove congestion at freight terminals and you remove one of the greatest burdens of the railroads and enable them to carry on their business with profit and dispatch. The same applies to piers, factories and storehouses. Transportation delays at any of them mean congestion of goods, a piled-up tangle of barrels and cases which renders speed in handling almost impossible after the trouble has really begun. The electric vehicle and especially the industrial truck have proved themselves almost indispensable in avoiding this particular difficulty. To what extent these can be applied and with what profit is well illustrated in the case of the Bush Terminal Company of Brooklyn.

By the use of storage-battery tractors hauling trains of three or four trailers between ships and the warehouses or factories it is possible to speed up the unloading of ships and the delivery of goods to the railroads to a pace quite impossible with animal-drawn vehicles and fully adequate even to the severe present requirements for rapid loading and unloading of vessels. As soon as a ship comes to her pier hoists swing the incoming freight to the pier deck in large masses stacked on false platforms. Trailers are run under these, and after the train is loaded the tractor pulls them out of the way to a chute, to the freight cars, or by hoists to the car doors. This is done so expeditiously that a car may be loaded and sealed and pulled out of the pier before the winches have lifted out of the vessel's hold another carload of material. The trailers are so easily handled and the tractors are so efficient and economical of space that it has proved possible enormously to increase the practical working capacity of the plant by their use.

The application of electric vehicles and of industrial trucks at the Bush Terminal is merely indicative of the wider and more extensive use to which these bearers of industry will eventually be applied in railroad, warehouse and manufacturing enterprises. The claims made for them by the electrical industry have been amply corroborated in the present instance, and with the general speeding up of many industries because of the war we shall be greatly surprised if such applications are not multiplied many times over. Certainly it shows a use for electricity that central station companies ought to welcome and push hard right now.

Protect Your Property

EXPENSES for adequate protection for power plants against all of the sinister dangers or possibilities of the times are unavoidable. It is a principle of insurance that cost rises as risk increases. If we are faced with greater obstacles to good and continuous service, the real question before us is: "How shall operation be maintained without a break?" There is no wringing of the hands because it takes more dollars. It is a problem now of not only unruptured supply but of keeping the large principal of the investment safe. Generating and distributing systems must be intact. Ask the stockholders who own the property, the bondholders who have a mortgage on it, and their reply is insistent that the officials shall take every precaution. Not every company will or can carry special insurance against the hazards of the period, but all can introduce physical and military or semi-military means of protection. The duty of doing so in this crisis is as plain as is the duty of rendering uninterrupted service in the normal condition of peace.

Interrelations of Technical Societies

IT is the history of evolution in the organic growth and development of scientific and technical associations that they develop to a certain stage, when the diversity of interests causes them to shoot off into separate branches which disengage themselves from the parent stem and form independent societies. Engineering was originally natural philosophy on its scientific side. The basic scientific organization has always been natural philosophy. In England it took early national existence under the name of the Royal Society, whose interests and discussions extended to the whole known universe. There were no subjects too great or too small or too different in the scientific world for the Royal Society to attack and capture for its *Transactions*. Gradually, however, special branches of science fell to the care of special scientific or technical societies, until at the present time there are many such, and the probability is that there will be yet more.

The question arises, therefore, as to what the conditions are that determine the desirable and proper degree of ramification and segregation. On the one hand there are the forces of specialization, tending to separation and urging the localized union of specialists; on the other are the costs and enfeeblement in numbers, tending to combination and opposing disunion from the main body.

The answer is that when the work of the proposed separate branch is sufficiently large to call for separate officers, administration and publications a condition of unstable equilibrium is set up that may result in separation, especially if the activities of the proposed branch naturally extend to fields and individuals not easily reached by the parent organization.

The case of the Illuminating Engineering Society may be cited. Prior to its formation questions concerning electric lamps might have been discussed by the American Institute of Electrical Engineers, questions of photometry by the Physical Society, and questions of physiological optics by medical societies; but the principles and practice of illuminating engineering could not adequately find a hearing anywhere. The formation of the society in 1906 not only brought all these separate questions into the appropriate common field but also added much incidental new material that could not previously have been stimulated into growth. Architects, electric lighting practitioners, gas practitioners, artists, builders, physiologists and optical specialists have all been attracted to the new society, for a common interest, in a manner and for a result which was previously impossible. The result has been a remarkable advance in the theory and practice of illumination, the formation of similar societies abroad, and the formation of an International Commission on Illumination, which has already aided in establishing international units and standards in illumination. All of this would have been impossible of attainment under the pre-existing régime. Moreover, thanks to the work of the society, the prestige of illumination as a science, an art and a profession has been publicly raised, so that good lighting in halls and dwellings begins to be recognized and appreciated—all of which is a national asset attributable almost wholly to the I. E. S., as its dozen volumes of *Transactions* can testify.

It only needs a cursory examination into the history and work of the I. E. S. to recognize that this society has amply justified, and will probably still more justify in future, its independent existence. What calls for attention is the development of interconnection between this and other technical bodies. What is wanted is a mechanism for uniting the aims, the influences and the *esprit de corps* of such separated organizations without hampering their autonomy or individual growth. The advantages of intensive specialization are accompanied by certain disadvantages due to scattering and loss of collective sociological momentum. Efforts should therefore be directed to methods of minimizing such disadvantages without arresting the advantages. A federation of technical and engineering societies is one way of accomplishing this result.

Some Experience with Aerial Cable

A PAPER in this issue by E. B. Meyer on the solution of an important engineering problem in line construction will carry much of value to the student of power transmission. The case in hand, although a somewhat unusual one, is likely, however, not infrequently to be duplicated in the extension of power networks. It was necessary to connect two generating stations by feeders at 13,200 volts. The region to be spanned was exceedingly marshy, so that a duct line unless laid on piles was impracticable, and an ordinary overhead system would have met serious difficulties in crossing trestles, bridges and railway freight yards. The first trial was made with ordinary lead-covered cable run on a pole line with fifty-foot spacing and having additional protection from jute and steel-tape armor. It proved efficient but too heavy, and as a result the special cable described in Mr. Meyer's article was devised and installed. It is a paper-insulated cable in a paper jacket covered with reinforced rubber put together somewhat after the fashion of a garden hose, cloth-vulcanized in the insulation. Outside this is a layer of rubber compound tape and a weatherproof braid finally incased in galvanized-steel tape armor.

This modified construction reduced the weight of the cable approximately 50 per cent and made it practicable to use something like standard transmission line construction with chestnut poles spaced at 90 to 100 feet, in places reaching out to a greater length. The suspension is from the usual messenger cable, in this case of $\frac{5}{8}$-inch seven-strand galvanized-steel wire. This messenger cable is strung rather tightly to prevent excessive sag, and when finally in place the cable is cautiously pulled up to it and made fast to the rings. The highly ingenious methods of doing this are fully described, as are also the details of the splicing, a thing which obviously requires particular care in a cable of this character. While necessarily somewhat heavy, a cable of this design has proved thoroughly practicable and desirable in installation. When made up with three conductors of

No. 1 equivalent, the weight is a trifle less than 4½ pounds per foot and the outside diameter is 2½ inches. The messenger cable is thoroughly grounded, and experience has shown that lines installed in this way are exceptionally free from trouble with lightning; in fact, it has not been considered worth the while to install lightning arresters to protect a line of this particular structure. In some instances on the same system ordinary lead-covered cable has lately been used in connection with a true catenary construction to lessen the strains on the line. So successfully has the aerial cable system worked out that in at least one instance it has been employed for working at double the voltage just mentioned. The plan seems to be one particularly well adapted for safe and reliable construction under conditions which render either ordinary aerial lines or underground conduits peculiarly difficult.

The Government Nitrate Plant

THE United States government stands committed to the construction of a fixation-of-nitrogen plant to insure a sufficient and reliable supply for the manufacture of high explosives in time of war, and presumably with agricultural needs in view in time of peace. The whole project is as yet in its formative stage, with much discussion going on as to the proper character of the plant and the most suitable location to obtain the best practical results. For the economical fixation of nitrogen the fundamental requisite is a very large supply of extremely cheap power. Information regarding the actual economy of the various processes which have been worked is rather scanty, but there is universal agreement that remarkably favorable power conditions are the fundamental requisite. The advantages of the Muscle Shoals site on the Tennessee River in Alabama are already very generally known. In a recent issue we printed a study of the situation from the economic standpoint by H. S. Putnam, which deals specially with the desirability of Rock Island, Ill., already the site of an important government arsenal, as the most suitable scene for operations on a great scale. The chief point of advantage at that locality, aside from its good position from a military and transportation standpoint, is the large amount of water power available on the Mississippi, amounting to 100,000 kw. to 125,000 kw. of electrical output. Mr. Putnam estimates that a complete hydroelectric plant can be put into action with an output of 100,000 kw. for a little less than $100 per kilowatt, certainly a low figure for a stream like the Mississippi and a locality so remarkably good for general manufacturing purposes.

An additional recommendation is that Rock Island is within very easy reach of the Illinois coal fields, rich in bituminous coal. A very moderate length of transmission line would make it practicable to establish, for equalization of hydraulic resources and for additional power, power plants at the mouths of the coal mines, utilizing in large measure waste fuel; and such combined plants are part of the project under discussion. Similarly, this coal field could be utilized for the working of fuel-gas plants to feed the boilers of the auxiliary steam service and at the same time to recover the important by-products from the coal itself. There is a further possibility, or rather extension, of the fuel-gas project in the destructive distillation of coal at low temperatures so organized that the maximum amount of valuable products of distillation can be secured, with usable gas as a by-product. The experience of the present war shows the immense importance of great supplies of the benzol and toluene.

Mr. Putnam figures out extremely low costs for energy produced by this general utilization of hydraulic and fuel resources, costs so low as to make the fixation of atmospheric nitrogen a thoroughly economical process. The great virtue of the site thus studied is the fact that coal distillation, steam generation and hydraulic power can be brought together to produce an economy in the final results difficult to attain elsewhere. For an emergency plant for war purposes, production of nitrates, together with the requisite supply of benzol and toluol from the distillation of coal, makes a specially advantageous union of material resources, and the situation of the whole industry in a region where labor is easily obtained and transportation facilities are of the best gives additional weight to the project. The result of so favorable a location would be that the combined industries could be made to work together so that the finished products might be shipped out at a relatively low cost of distribution, making a far better showing than would be the case, even if the hydroelectric part of the enterprise could be still more cheaply carried through, were the plant at a distance from cheap auxiliary steam power and from the invaluable raw material of the coal.

The Coming Issues

THE next issue of the ELECTRICAL WORLD will contain an article explaining a method of calculating the effect of adding conductors to a direct-current network system. This problem is one that arises frequently since distribution systems are not the product of a single design or layout but the result of gradual growth. Another article to be presented in that issue will dwell on features of the largest hydroelectric plant in New England, in which several new and interesting construction schemes have been embodied. The plant serves a 66,000-volt transmission line. Various other contributions of interest to engineers and operators will also be included. In the fourth issue of the month commercial problems from a managerial standpoint will receive especial attention. Of particular interest in that issue will be the discussion on granting free appliance repairs to customers. During the period of war preparations and stress the ELECTRICAL WORLD will seek, in so far as it is expedient and prudent, to chronicle what is being done to safeguard electricity supply, and how electrical engineers and the central station and electrical manufacturing industries may be of service to the nation.

Electric Trucks — A Remedy for Terminal Freight Congestion

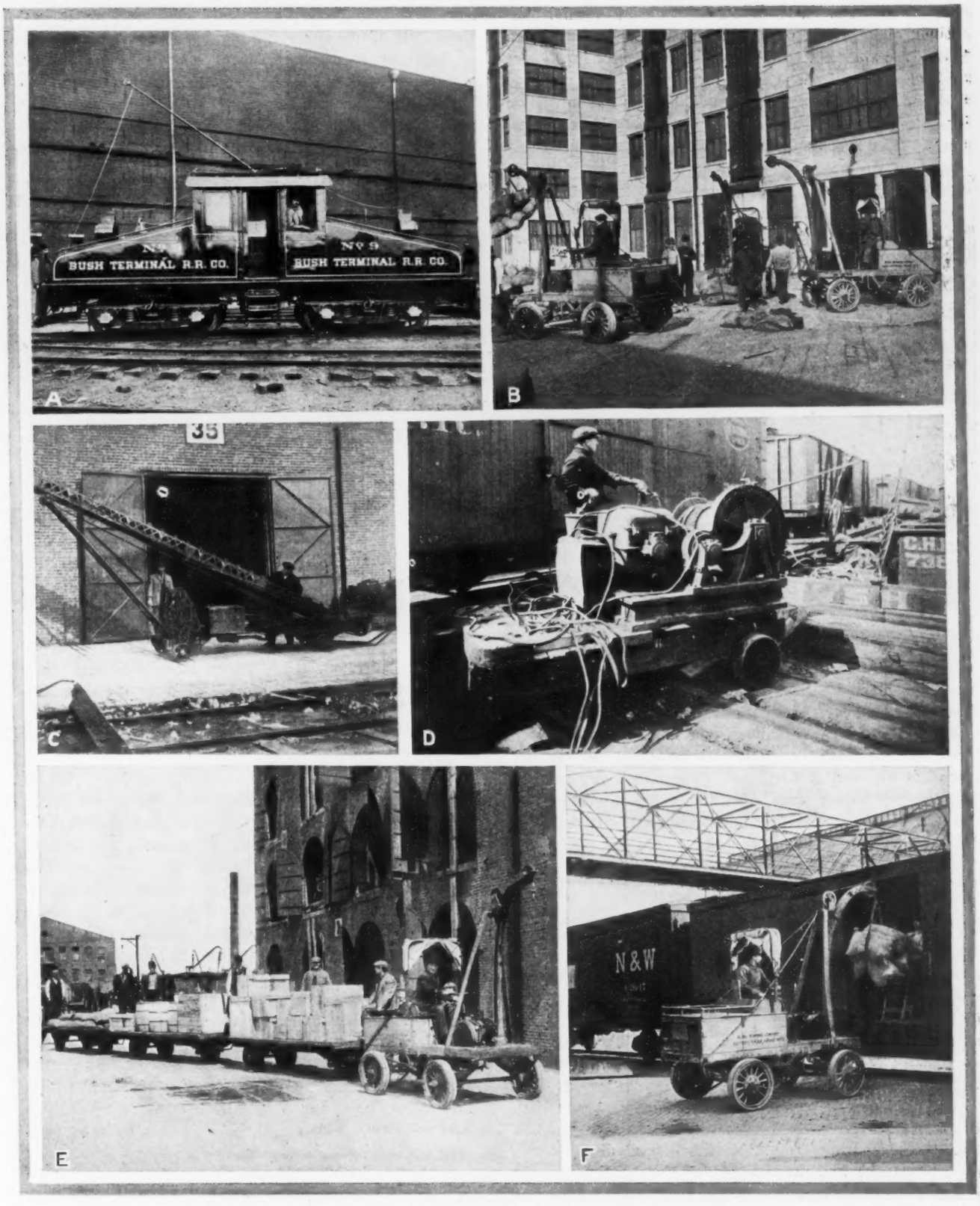
Enormous Off-Peak Load in Battery Trucks Available to Central Stations for the Asking—Bush Terminal, Brooklyn, N. Y., Uses 12,000,000 Kw.-Hr. Annually

WITH industrial plants and transportation systems taxing their facilities to make deliveries in reasonable time and with the congestion in traffic more pronounced than it ever has been before, it seems that the psychological moment has arrived for vehicle manufacturers and electric-service companies to urge the use of electric trucks and tractors for handling terminal freight. Wonderful possibilities are open in this line to central stations, as the load may be made off-peak. Not merely a few companies have the opportunity—a field is open in every city which is an industrial or a shipping center. Practically every industrial plant can be advantageously equipped with electric transveyors instead of hand trucks to handle freight inside the plant, and electric vehicles can be used for trucking purposes outside. Examples of what can be done in this line are afforded by some of the factories or wholesale produce houses in several large cities. The advantages of electric trucks and tractors are most obvious, however, in handling terminal freight. They can enter piers, warehouses, etc., without creating a fire hazard; they can be started promptly, and thus save time; they exert high tractive effort and do not get stalled easily in snowy weather; they do not occupy as much space as horse trucks of the same capacity and hence reduce congestion, and they can turn in small space. Furthermore, the length of haul is well within the range permissible with storage batteries.

To be convinced of the remarkable changes which electric trucks can work at terminals, it is only necessary to observe traffic conditions where freight is being handled by electric trucks and tractors and where similar quantities are being trundled by hand and horse trucks. Where electrical equipment is used there is relatively little confusion or congestion, owing to the small space occupied by the trucks when loading and to their ability to wind through traffic. There is practically no delay in loading, as the electric truck can be quickly placed in position and the tractors or transveyors can carry larger loads and move faster than hand trucks. As a result, with the same platform space or pier room freight can be handled much more rapidly with electrical equipment than with hand and horse trucks. Eventually every railroad and ship terminal will turn toward the electric truck as a solution for its transportation problems.

Under present conditions the investment in equipment is not thought such a bugbear as formerly by industrial plant or terminal managers so long as it can be shown that the equipment expedites operations. This has been proved conclusively in past installations and will be evident from the information presented later in this article. Most companies are so engrossed in the big profits they are making that they will not listen to arguments based on economy of operation alone. Expediency is the watchword now.

The use of electric trucks, transveyors, tractors, etc., at terminals is not new. They are being employed on numerous seaboard piers and also inland at railroad terminals. A pioneer among the users of electric vehicles for these purposes, however, is the Bush Terminal Company, Brooklyn, the largest private shipping terminal in the world. As many people know, this terminal consists of factories, warehouses and railroad and steamship transportation facilities so related that the occupants of the factories can receive raw materials and ship finished products almost directly by rail or water. What transportation is needed between piers or railroads and the lofts or warehouses is handled by electric tractors, battery cranes, motor-driven whip hoists, portable hoists, elevators, motor-driven piling machines, and trains pulled by electric locomotives. Delivery and collection of freight outside the terminal are handled with electric trucks.

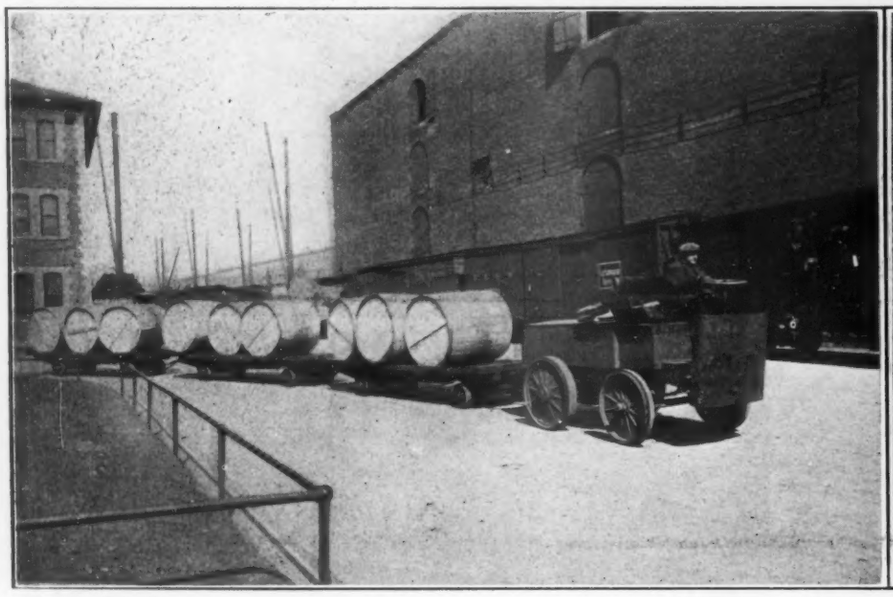


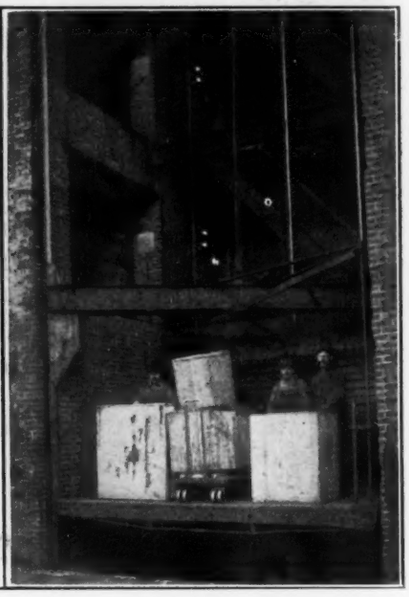
APPLICATIONS OF ELECTRICITY AT BUSH TERMINAL

A—One of the four electric locomotives used to transfer freight cars between the piers, storehouses, loft buildings and classification yards. B—Battery-crane tractors loading trailers which they will later haul to their destination. C—One of the tiering machines used to pile merchandise in the warehouses. D—Portable hoist, of which there are sixty for unloading lighters, etc. E—Crane tractor hauling four loaded trailers. F—How battery-crane tractor is used to load and unload freight cars.

The terminal is situated on the east shore of New York Bay and covers approximately 200 acres (80.94 hectares), having about one mile (1.609 km.) of water front. Nearly 75 per cent of the area is covered with piers, warehouses, factory buildings and railroad yards. Eight piers, at which ocean-going vessels can load and unload, are provided. Six are 1350 ft. (411.48 m.) long by 150 ft. (45.72 m.) wide, with slips 270 ft. (82.29 m.) wide; and one is 1400 ft. (426.72 m.) long by 270 ft. (82.29 m.) wide and has double decks having a floor

area of 15 acres (6.07 hectares). Under normal conditions, about twenty-eight ships ranging in size from 5000 to 6000 tons (4535 to 5440 metric tons) are berthed at one time. One transportation line plans to load and unload ships of about 6000 tons (5440 metric tons) capacity at the rate of one every seventy-two hours. The average clearing time, however, is five to seven days. The relative positions of the warehouses, piers and lofts are shown in an accompanying illustration. A 1200-car freight classification yard is provided so that cars are always on hand whenever any tenant of the Bush Terminal loft buildings desires one placed at his loading platform. These cars are spotted with electric locomotives, of which there are three 40-ton (36.3 metric ton) and one 65-ton (59 metric ton) trolley-type General Electric units.





BATTERY TRACTOR HAULING LOAD OF CASKS AND ELECTRIC WAREHOUSE ELEVATOR THAT CAN BE LOADED DIRECTLY FROM STREET

METHODS OF EMPLOYING ELECTRICITY TO HANDLE TERMINAL FREIGHT

Shipments received by water may go: (1) direct to freight cars, (2) to lighters that connect with New Jersey and New York City, (3) to trucks making deliveries in Brooklyn or New York City, (4) to warehouses, or (5) to the factories. Similar possibilities are open to the movement of freight received by rail. To illustrate specifically how freight is handled at this terminal it will be assumed that a loaded ship has just made fast at the double-deck pier previously mentioned and that the hatches are open for unloading. The ship's winches hoist the incoming freight to the second deck of the pier. If these are inadequate for the service, use is made of a number of portable electric hoists, like the one shown herewith, by connecting them with outlet boxes placed every 90 ft. (27.43 m.) along the piers. At night, or when the ship's holds are dark, cargo lamps may be connected with outlets similar to those used to serve the hoists and hung over the ship's hatches or wherever desired. Sometimes the cargo is unloaded by the use of slings or rope baskets and sometimes with special crates, depending on the nature of the material.

Suppose that a cargo consisting of canned pineapple, which comes in cases, has arrived. Unloading it by hand, one man could carry only one case, or at best wheel four at one time on a hand truck. At this terminal, however, as many as seventy-two cases are stacked on false platforms, a line is coiled around them, and they are hoisted onto the pier. Without removing the cases from the false platforms, transveyors are run under the platforms. After four or five transveyors are thus loaded and hooked together a storage-battery tractor is used to haul them to the point of disposal. If the cargo consists of material that has to be rehandled in loading or unloading the trailers, the battery cranes are generally used to do the hoisting.

In general, when packages weighing 1000 lb. (453.59 kg.) or more have to be transported one of the crane tractors is used to load and unload the packages. Otherwise the tractors are only used for hauling the trailers (three or four at a time) between the vessels and the warehouses. For every tractor in use there are twelve trailers. Four of these are left at each end of the route for loading and unloading, and the remainder are always in use between the termini. With this arrangement the tractors can be kept moving constantly. Some of the crane tractors cannot enter warehouses because of lack of head room, but otherwise they are run into warehouses and alongside the vessels at the piers.

If the goods are to be shipped out by rail, the tractor pulls the transveyors to a convenient chute down which the cases may be slid into box cars below. If the freight is too bulky to handle by means of chutes, it is lowered through a hatchway to a position opposite the car door by an electric hoist. Meanwhile the transveyors have been slipped out from under the false platforms and taken back for another load. By the time the tractor has made a round trip the hundred or more cases which constitute its load are packed away in the car for final shipment. Thus a freight car may be loaded and sealed and may actually be pulled out of the pier before the winches have hoisted the equivalent of another carload out of the ship's hold.

If the cargo or part of it is intended for local delivery, the battery tractor hauls its train of transveyors to the extreme end of the pier, where the goods are lowered

by traveling electric hoists to a loading platform at which electric trucks are backed up. Since it is impossible to remove all freight from the piers as fast as it comes from the ships, spaces are marked off on the pier on which the freight may be assorted according to its destination. Freight which is intended for storage is generally set aside in this manner until after the first rush of disposing of prompt-delivery lots. It is then carted away to the storehouses by tractors pulling three or four trailers and hoisted to the particular floor desired by elevator, whip hoist or portable hoist.

USE OF ELECTRICITY IN STORING GOODS

For hoisting freight into the warehouses, outriggers are provided along the cornice of each building over the doors. Through these run cables which may be operated by portable hoists or group hoists controlled by one man. Three motor-driven hoisting drums are provided for each block of six buildings. Since a man is required at the unloading window in the warehouse, anyway, the Bush Terminal Company is considering installing individual motor-driven hoists over each vertical row of windows and having this man control the motor, thus replacing the whip hoists and the special operators. Sixty portable electric hoists are available for use, there being quite a demand for them on the lighters. Freight which is warehoused must be stored with the greatest speed and economy of space. For this service electric tiering machines are used which automatically pile the merchandise in regular rows clear to the roof. These machines operate on the endless-chain principle and are easily moved from one location to another. Plugs and long, flexible cables permit connecting them with outlets which dot the walls of the buildings.

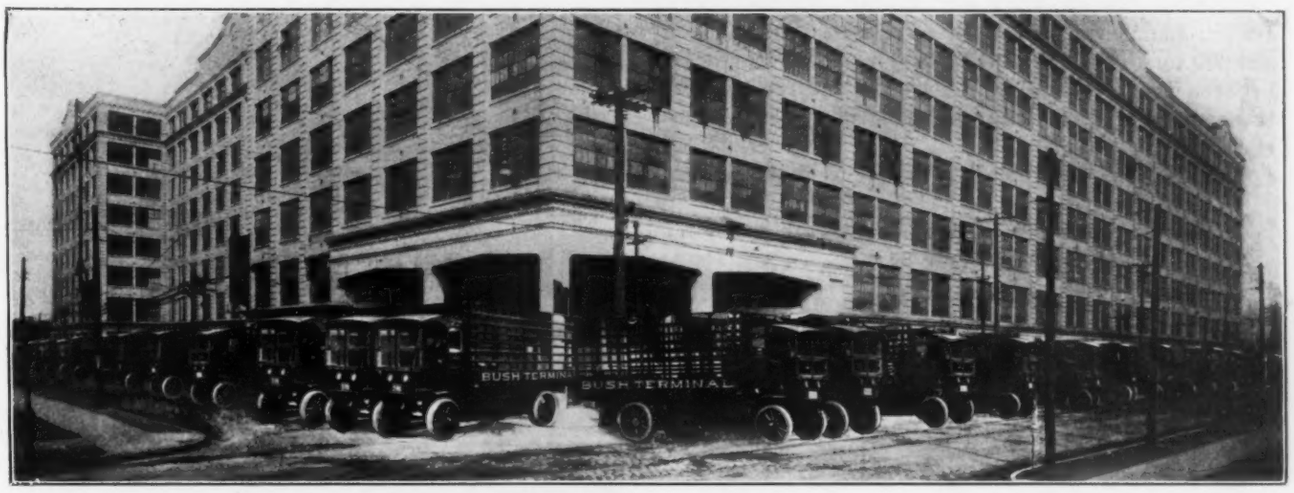
If freight is brought in by rail, it can be delivered directly to the factory or warehouse doors, as tracks are provided alongside every building. Because of these facilities and the car-storage yard it is a simple matter to get a car to a tenant's door within a very short time after he calls for one. All cars are unloaded at platforms which are level with the car floors.

The methods of loading the ships are practically the reverse of those used in unloading. Goods are brought in by trucks, by train and by battery tractors from the stores and are assorted to facilitate stowing in the ship's hold. By the time the ship is free from incoming freight the cargo is alongside ready for the winches. There is no delay, no confusion.

In handling mixed freight by the old methods something like 50 per cent of the operating cost is eaten up by inefficiencies, delays, wastes, excessive labor costs, etc. On the double-deck pier at the Bush Terminal, however, practically all of this waste is eliminated by the mechanical aids mentioned and the better arrangements permitted thereby. Taking into consideration all movements of the freight by tractors and dock trucks, only about 10 per cent of the tractor's time is lost because of coupling, uncoupling and spotting the dock trucks. Thus the trucks are actually in motion 90 per cent of the time.

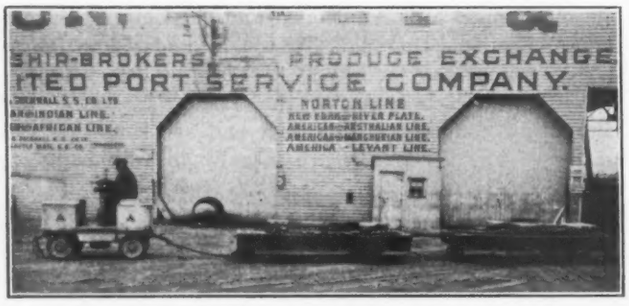
ELECTRIC TRUCKS FOR CITY DELIVERY

City deliveries are made with electric trucks, which are loaded at night so they are ready to start early in the morning. After a chauffeur has delivered his goods he telephones to the Bush Terminal to ascertain whether some terminal-bound freight can be picked up on the way back. The batteries are charged at night and receive a boosting charge during the day. Some of the trucks are garaged in Manhattan and some at the terminal. The garage which cares for the tractors and for the electric trucks is operated as a separate department which charges the parent company and various tenants for its service according to fixed rates. The chauffeurs and tractor drivers who are on the pay roll of the garage department are responsible for seeing that the trucks are not overloaded and that the equipment is not used for purposes for which it is not intended—such as shifting cars, etc. Every night the foremen, whose duties are to supervise the transportation end of the business, assemble in the office of the superintendent of transportation and decide on what materials have to be moved the following day. Available transporting equipment is then divided among the foremen and requisitions are made on the garage for the equipment for each job. In the morning the drivers report to the different foremen according to these orders. Great economies have been obtained with the tractors, compared with the results of operating mule-drawn trailers, although the latter are still used on small jobs and to supplement tractors at busy times.



SOME OF THE ELECTRIC TRUCKS EMPLOYED TO MAKE CITY DELIVERIES AND COLLECT FREIGHT

So that the tractors and trucks shall not have to be run into fixed positions in the garage for charging, the circuits have been run to outlets on the ceiling and the charging plugs attached thereto and supported by counterweights which permit them to be raised when not in use. Anderson charging plugs and Cutler-Hammer charging boards are employed. Spare truck parts are



SMALL TRACTORS HAULING PIGS OF METAL OVER ROUGH PLANKING

kept in stock for rebuilding one of each kind of truck. At night when a truck is brought into the garage loaded the weight is taken off the springs by jacking up the platform.

Costs of Using Battery Trucks and Tractors

The data thus far available on the energy consumption of the tractors show that they have performed their duties with a current consumption of 3.31 amp.-hr. per ton-mile (2.27 amp.-hr. per metric ton-km.). The average weight transported has been 123 tons (115 metric tons) and the length of haul between 100 ft. (30.48 m.) and 6000 ft. (1828.8 m.), or an average of 0.4 mile (0.64 m.). Four-wheel platform trucks, 14 ft. (4.27 m.) long by 4.5 ft. (1.37 m.) wide and equipped with roller bearings, are employed in this service Among the various forms in which the miscellaneous warehouse commodities are handled in the raw state are bales, bags, cases, barrels, mats, etc. Of the 1,325,000 tons of freight handled at the Bush terminal per year, about 324,000 tons (294,000 metric tons) is moved by tractors between the piers and warehouses. The remainder is transported in trucks or trains handled by electric locomotives.

Several typical examples will serve to show the relative advantage of handling material by electric tractors instead of by hand or with horse trucks. For instance, in loading trailers with bales of fiber the battery cranes and tractors can perform the work at a cost of 7.2 cents per bale, whereas with hand operation it costs 8.8 cents per bale. Three-hundred pound (136-kg.) bags of ore can be loaded onto cars by battery cranes at a cost of 21 cents per ton (23 cents per metric ton), whereas with hand operation it costs 32.4 cents per ton (35.7 cents per metric ton). In addition, the battery crane permits an average increase in speed of handling of about 40 per cent. Comparing the use of horse trucks and tractors for loading and unloading case goods and transporting them, it costs 16.1 cents per case with horse truck and 14.2 cents per case with tractors. The last two values are based on hauling the commodity 450 ft. (137.16 m.).

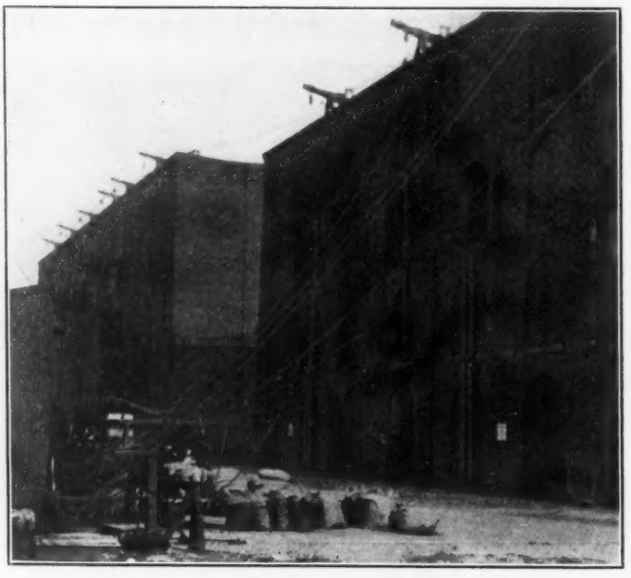
RATING AND BATTERY EQUIPMENT OF TRUCKS AND TRACTORS

Number and Make	Haulage Capacity (Tons)	No. and Type of Cells
Trucks:		
25 Walker	5	60 A-12
3 General Motors	5	60 A-12
2 Walker	2	56 A-8
3 General Motors	2	60 A-8
Tractors:		
4 General Vehicle	10	59 A-8
4 Walker	15	60 A-12
1 Lansden	10	60 A-8

Storage-battery tractors show an advantage also when the cost of operating them is compared with that of moving commodities in box cars. For instance, suppose that 400-lb. (181.4-kg.) bales are to be moved from a lighter to a pile in the storehouse. The complete cost of operation with a battery tractor is 8.7 cents per bale, whereas when moving the material in the box cars the cost is 26.2 cents per bale. At the Bush Terminal the cost of energy for loading, unloading and transporting materials amounts to a small percentage of the total operating cost per year. Labor expense represents 41.7 per cent of the total operating cost. The yearly operating cost of the tractors is 66.3 per cent of their initial cost.

The performance noted in the preceding data is rather remarkable in view of the fact that some of the batteries are operated at 75 per cent overload and are unprotected from the excessive jar and vibration due to the trucks and tractors operating over the rough cobblestones and boards between the piers and warehouses. Edison batteries are used in the trucks and tractors.

In conclusion it might be pointed out that the Bush Terminal company did not wish to use electric trucks and tractors at first. Neither did it buy all of the trucks it now has on the spur of the moment. A few trucks were tried in the beginning. Such satisfactory results were obtained that more were purchased. Some indication of the way in which electric transportation is now considered by the Bush Terminal Company is given by the fact that it has recently ordered twenty more 5-ton (4.53-metric ton) tractors. All of the energy used at this terminal for freight-handling purposes, light and power is furnished by the Edison Electric Illuminating Company of Brooklyn.



MOTOR-OPERATED WHIP HOISTS SERVING WAREHOUSES

Saw-Mill Waste for Generating Electricity

How an Arkansas Lumber Company Has Co-operated with a Central Station by Supplying It with Steam Generated from Wood Waste

BY J. B. WOODS
Malvern, Ark.

UNDER ordinary lumber-manufacturing conditions about two-thirds of the volume of the logs fed to the mills is converted into salable lumber. The rest goes into slabs, sawdust, culled pieces, cut-off ends and the like fit for nothing but fuel. While part of this waste may be burned instead of coal for the production of power in the mill, there is generally more than

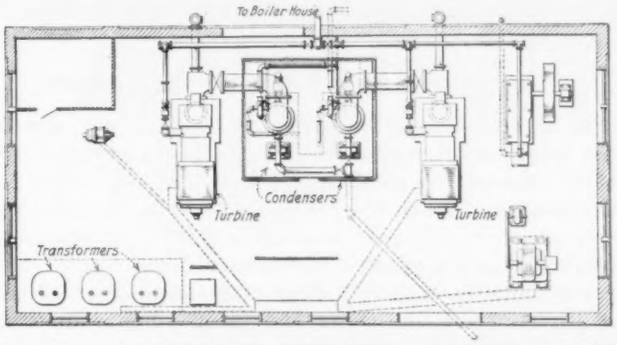


FIG. 1—ARRANGEMENT OF GENERATING EQUIPMENT SUPPLIED WITH STEAM FROM NEARBY SAWMILL

enough for this purpose, so an excellent opportunity is afforded for the manufacture of byproducts, such as paper, chemicals, small wooden novelties, etc. A still simpler method of utilizing the wood waste, however, has been adopted by the Arkansas Land & Lumber Company, Malvern, Ark., which has co-operated with the Arkansas Light & Power Company in producing electrical energy out of waste products from the sawmill. The wood is burned in boilers at the lumber mill and steam conveyed through 8-in. (20.4 cm.) pipe to the control station on the lumber company's property.

There are two sources of fuel at this mill: the sawmill and the planing mill. As the first mentioned is only a few yards from the boiler room, all waste is handled by a system of chain conveyors which conducts the scraps of wood to a grinding machine. After being converted into an easily burnable state, the waste is deposited in a brick fuel house at one end of the boiler room. From the planing department waste is conveyed to the depository through a blow pipe, in which a forced draft is maintained by a high-speed fan. Small pipes reach from the main conveyor to each planing machine, and also to another grinder the purpose of which is to reduce large scraps to the size desired for burning in the fire-boxes. Two other chain conveyors are provided, one of which brings waste from the fuel house to the boiler-room wall, while the other carries it over the boilers in a tube which is equipped with feed chutes. By the pressure of a lever, fuel can be precipitated into any of the fire-boxes. The wood waste which passes across the boilers without being used is carried back on the return chains into the fuel house for future use. As these two chains are operated by an engine inside the boiler room, the firemen can regulate the volume of fuel moved to meet the needs of the boilers.

Special grates are required for burning the sawdust. They consist of units measuring 8 in. by 3 ft. (20.4 cm. by 0.6 m.) on their upper surfaces and containing perforations 0.75 in. (19 mm.) in diameter. The boilers are of the horizontal-tubular type, set in steel casings, with steel fuel chutes discharging into each firebox. They are grouped in batteries of four, and are rated at 200 hp. each when carrying 150-lb. (68 kg.) pressure. Altogether, they consume the waste from a plant which produces about 75,000 ft. (23 km.) of lumber daily, and supply steam to two large mill-drive engines, two smaller auxiliaries, ten dry-kiln chambers, two steam water-pumps and the turbines in the electric-service plant.

The arrangements of equipment in the boiler room and generating station are shown herewith. In the latter are two 2300-volt, three-phase Curtis horizontal turbo-generators, each guaranteed to deliver 500 kw. and using 19 lb. (8.6 kg.) of steam per kilowatt-hour at 125 lb. (56.7 kg.) pressure. The demands upon this plant require only one machine in continuous operation, so that the steam consumption under winter conditions is about equivalent to output of two boilers during peak load.

Three 2300/110-volt Moloney transformers furnish power for the small motors and the station lighting system, while three large 2300/22,000-volt General Electric transformers supply energy for a 30-mile (48.3 km.) line to Arkadelphia.

Exhaust steam is discharged into LeBlanc jet condensers, equipped with 25-hp. Westinghouse induction motors, which take current from the turbines. Cold water for condensing is taken from a nearby creek, while the warm waste discharges into the log pond. The town of Malvern receives energy from this plant at the generated voltage.

The amounts of energy consumed in Malvern and Arkadelphia are in the ratio of 1.5 to 3.5, but Mal-

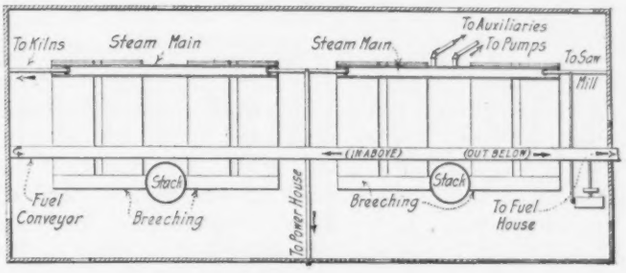


FIG. 2—SAW-MILL BOILER ROOM GENERATING STEAM FROM WOOD WASTE

vern's demands are chiefly for lighting purposes, while those of the latter city are for industrial motors to a large extent. The peak demand in Arkadelphia occurs in daytime, when the sawmill is using a great volume of steam. The critical period is just before 6 p. m., when motors are running and electric lamps are being turned on. After this peak ample steam is available for

operating the generators, since the mill machinery is shut down and only the dry-kilns, pumps and conveyor engine require steam. This co-operative arrangement between the lumber and central-station company has existed more than two years and has proved successful and satisfactory to both parties. The electric-service company is relieved of buying coal, while the lumber company has solved the waste-disposal problem at fair profit.

THE EFFECT OF SULPHUR ON THE VALUE OF COAL

How Different Forms of Sulphur Affect the Heating Value of Coal, Produce Corrosion and Augment Clinkers

BY ALBERT MARTINEAU

Not very long ago only very large consumers of coal purchased their fuel on specifications, but it is now becoming increasingly common for small consumers to do likewise. In many of the specifications drawn up by these small consumers there are usually, in addition to the definite stipulation regarding the heating value, statements concerning the amounts of volatile matter, moisture, ash and sulphur that shall be permitted. While there are very good reasons for specifying definite properties in some cases, some requirements are stated in such a vague way that their value is very questionable. For example, definite statements are made regarding sulphur, without stating in what form the sulphur may be present, or without fully understanding the effect of the presence of sulphur in its various forms. For this reason attention will be called in a brief and general way to the action of sulphur, and why its influence is considered deleterious.

Sulphur may be present in coal in several different forms, the most common of which is iron pyrite (FeS_2). Sometimes the pyrites are divided very finely, the particles being so small as to be barely discernible. At other times large masses are present, which are immediately recognizable. Organic sulphur, which is sulphur combined with carbon or carbon and hydrogen, is also present quite frequently. Sometimes free sulphur is found, but where it occurs it is in such small quantities that is of relatively little importance compared with the other forms. Sulphate of iron, lime and aluminum are often found in weathered coal which has been standing a long time exposed to moisture and air, such as in the outcrop of a coal seam.

The effect of sulphur depends upon the form in which it is present. When coal is consumed sulphur of the unoxidized form is burned to sulphur dioxide, therewith liberating heat. On the other hand, if the sulphur is in the form of ferrous sulphate or calcium sulphate it has no heating value, but instead absorbs heat on combustion of the coal. In weathered coal the amount of oxidized sulphur is ordinarily so small that its effect on the heating value of the coal can be ignored. On the other hand, for coal which has been newly mined the heating value varies from 2250 to 2950 calories, depending upon whether the sulphur is present as organic sulphur or as pyrites. When iron pyrites burn, resulting in the formation of sulphur dioxide (SO_2) and ferric oxide (Fe_2O_3) the heat of combustion is about 700 calories higher than that of sulphur in organic form which burns to sulphur dioxide.

The presence of sulphates is much more detrimental to heating value in weathered coal than in coal which has been newly mined. For example, take the heating value of 1 per cent sulphur existing as pyrite as 29.5 calories. During combustion of the coal the decomposition of ferrous sulphate ($FeSO_4\ 7H_2O$) corresponding to 1 per cent of the sulphur absorbs about 21.5 calories, being a loss therefore in heat of about 51 calories, or three-fourths of 1 per cent. Considered alone, this would not be such a very serious matter, because usually the amount of sulphur present does not exceed 1 or 2 per cent. But 1 per cent of sulphur existing as pyrites absorbs 2 per cent by weight of oxygen on oxidation, and absorbs and combines with about 4 per cent of water, which is not given off on air-drying. It can thus he seen that air-dry coal is liable to be about 6 per cent heavier on account of the oxidation of 1 per cent of sulphur, and the calorific value per unit of coal 7 per cent lower in heating value instead of only three-fourths of 1 per cent.

Other Reasons Why Sulphur Is Detrimental

In addition to the lower heating value of coal due to the presence of sulphur in its various forms there are other reasons why sulphur is detrimental. One of these is corrosion. When the flue gases pass up the chimney they cool off and condense against the comparatively cold sides of the stack. The sulphur dioxide in the flue gases which have formed during the combustion of the coal unites with the water and forms sulphurous acid, which, remaining in that form or changing to sulphuric acid by further oxidation, has a corrosive effect upon the metallic stack and other metallic structures in close proximity.

Furthermore, the greater the percentage of sulphur the greater the chance of clinker forming in the ash, although there are exceptions to this statement, of course, depending upon the form in which the sulphur is present, the form when converted to ash, etc. However, sulphur is usually present as pyrites, so that the iron oxide formed during combustion readily unites with the highly silicious constituents of the ash to form clinkers. The higher the temperature the more readily this occurs. Further, iron pyrites give off about one-half of their sulphur on being heated, leaving ferrous sulphite. Therefore, in coals rich in pyrites the conditions are very favorable to formation of clinker, especially if the pyrites are present in good-sized lumps. Iron oxide alone will not cause clinker, but in the presence of silicious constituents of the ash it will. Neither will ferrous sulphite clinker by itself. With pyrites in coarse aggregates, and with finely powdered ash of a highly silicious nature, however, ferrous sulphide will cause clinker.

Summarizing, the presence of sulphur is not welcome in coal since it lowers the heating value, causes corrosion of metal and concrete structures, and increases the difficulties of operating the boilers and disposing of the waste products. Which of these objections is the most important to consider depends, of course, upon circumstance, the price of coal, the methods of firing, the form in which the sulphur is present, etc. With the increasing use of specifications for the purchase of coal, and the greater refinements which will come into them, the indications are that sulphur, its various forms and their effects on heating value and operation will receive more attention as time goes on.

Overcoming Difficulties With Aerial Cable

Problem of Supplying Service Where Conditions Do Not Permit the Use of Open-Wire or Underground Circuits Has Been Met by One Operating Company by Installing Aerial Cable

BY E. B. MEYER
Assistant to Chief Engineer, Public Service Electric Company of New Jersey

SINCE the European war began electric service companies have been confronted with numerous operating problems in connection with their transmission systems due to the rapid growth of commercial loads which has resulted from increased industrial activities. The pressure thus brought to bear against central stations has been considerable, since hardly any industrial plants had time to build their own generating stations because of the short time permitted by their foreign contracts to make deliveries. Furthermore, the rates and service offered by utility companies made it hardly worth while to consider building isolated plants.

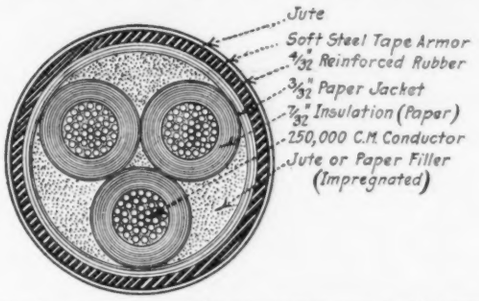


FIG. 1—MODIFIED FORM OF CABLE FOR 13,200-VOLT OVERHEAD SERVICE

This rapid and unexpected growth in business has made it necessary for central station companies to adopt special methods in the solution of their problems, particularly in cases where existing lines had been designed for low-voltage and small-capacity service. One of the special methods of solving these transmission problems has been by the use of aerial cable run on poles and supported by messenger wire, a form of construction similar to that used in telephone work.

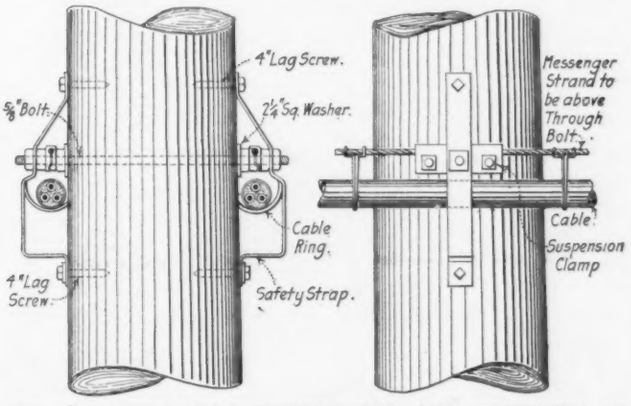


FIG. 2—DOUBLE-ENDED THROUGH-BOLT FOR SUSPENSION OF MESSENGER

Recently a large utility company found it necessary to connect two of its main generating stations with tie feeders. Most of the land between the two stations was soil of a marshy character, through which it would have been impossible to run a duct line without the use of foundation piling. The running of overhead wire was considered, but was found impracticable because the line, in several places would have to cross freight yards, trestles and bridges and the owners of these structures objected to open-wire high-tension lines. It was therefore concluded that the use of aerial cable would furnish the most satisfactory solution of the problem.

In this installation ordinary lead-covered cable of the same type as for underground work was run on a pole line with 50-ft. (15.24-m.) pole spacing. To protect the sheath from mechanical injury a covering was applied consisting of several layers of jute and marlin with an outer armor of soft-steel tape. This type of cable was found undesirable for aerial work, however, because of the excessive weight of the cable and the fact that standard pole-line construction could not be used. To overcome these objections a special cable was developed.

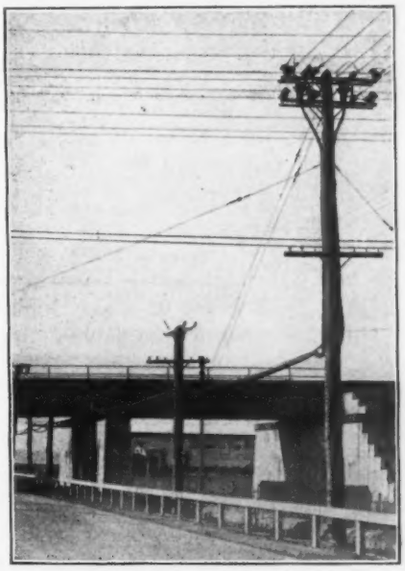


FIG. 3—AERIAL CABLE CROSSING UNDER RAILROAD BRIDGE AND ELECTRIC RAILWAY POWER CIRCUITS

In Fig. 1 is shown the modified form of cable for 13,200-volt operation, which is made up with 7/32-in. (5.55-mm.) paper-conductor insulation, a 3/32-in. (2.38-mm.) paper jacket and a 4/32-in. (3.18-mm.) reinforced-rubber covering over the paper jacket. The construction of the reinforced rubber is similar to that of the ordinary garden hose, several layers of cloth being vulcanized in the rubber. The entire cable is then covered with tape well saturated with rubber compound and a weatherproof braid which is thoroughly impregnated with a waterproofing compound. For mechanical protection the whole core is incased in an armor made of galvanized steel tape. This form of construction reduces the weight of the cable approximately 50 per cent and permits the use of lighter pole-line construction.

The principal advantage of aerial cable for tie-feeder installations is that it makes little difference how many working lines are carried on a single pole line. Additional cable may be run, existing construction changed, transferred or repaired without taking any line out of service except the one on which the actual work is being done. Lightning discharges seem to have little effect because the messenger wire which carries the aerial cable is permanently grounded.

A pole line carrying five 13,200-volt feeders is shown in Fig. 8. This line has been in operation for more than six years without the occurrence of a single failure. Class B chestnut poles, with a normal spacing of 90 ft. to 100 ft. (27.43 to 30.48 m.) are usually required for aerial cable installations. Where conditions make it necessary, sections as long as 150 ft. (45.72 m.) are permissible, but in such cases the adjacent sections should not exceed 130 ft. (39.62 m.). Sections longer than 150 ft. (45.72 m.) should receive special attention, and Class A poles should be used on long sections and at points of special strain.

The location and frequency of guys is largely dependent on local conditions and can in most cases be decided by a competent line superintendent. Attention is called, however, to the fact that the strain at dead ends and corners is very great, frequently being as much as 25,000 lb. (11,339.8 kg.). These points of special strain need to be well guyed. Both the anchors and the guys should be designed with a factor of safety so high that the messenger will fail before the pole will pull over. In all cases it will be necessary to reinforce the guy stubs by an anchor guy.

For the suspension of the messenger a double-ended ⅝-in. (15.88 mm.) through-bolt is recommended, as illustrated in Fig. 2. The use of a safety clamp is also desirable. This clamp serves the double purpose of reinforcing the through-bolt and preventing the cable from falling to the ground in case the rings fail. Careful tests made on this type of suspension show that it will withstand the maximum loads to which it will be subjected.

The clamp used is similar to that employed by the American Telephone & Telegraph Company, the size of clamp depending on the size of the messenger strand adopted. The clamp is designed expressly for construction of this character and is not built like guy clamps, which are designed to grip two strands instead of one. It affords a greater lever arm for the bolts to work upon in grasping the messenger and supports the messenger strand closer to the bolt, thereby decreasing the bending moment on the bolt due to the weight of the cable.

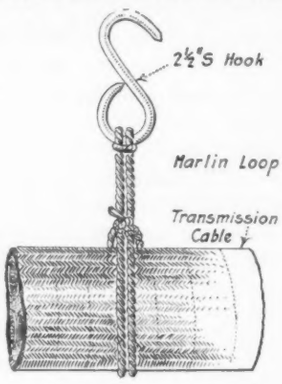


FIG. 5—METHOD OF SUPPORTING CABLE WHILE IT IS BEING INSTALLED

The messenger strand should always be placed above the bolt in order that the weight of the cable shall not be supported by the clamp. Various forms of cable rings may be used in supporting the cable on the messenger wire. Where two or more cables are to be installed on a pole line, they are usually suspended in pairs, two from each through-bolt, in order to save labor of installing. The messenger is extra-strength ⅝-in. (15.88 mm.) seven-strand galvanized wire. The wire composing the strand should be free from scales, inequalities, splints or other imperfections not consistent with the best workmanship. It is usual in purchasing galvanized-steel wire of this character to have it conform to a specification covering the galvanizing. This is necessary as otherwise inferior-grade wire might be supplied.

It is very important that the messenger wire be drawn as tight as possible, in order to prevent excessive sagging when subjected to the weight of the transmission cable. If this is not done an unsightly installation will result. After the messenger wire has been given its final pull and properly dead-ended, the placing of the aerial cable is the next step. In pulling the cable up to the messenger wire it is very important that due precautions be exercised in order that it may not be damaged in any way and not subjected to excessive strains which would tend to weaken or damage the insulation.

The first reel is set up in the usual manner and the cable "run off" to the first pole, at which is placed a sheave of approximately 12 in. (30.48 cm.) diameter,

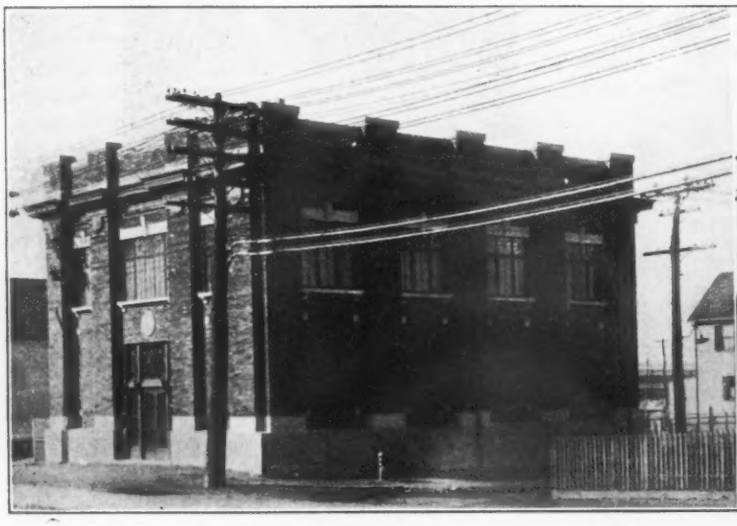


FIG. 4—TWO AERIAL CABLES ENTERING A POWER SUBSTATION

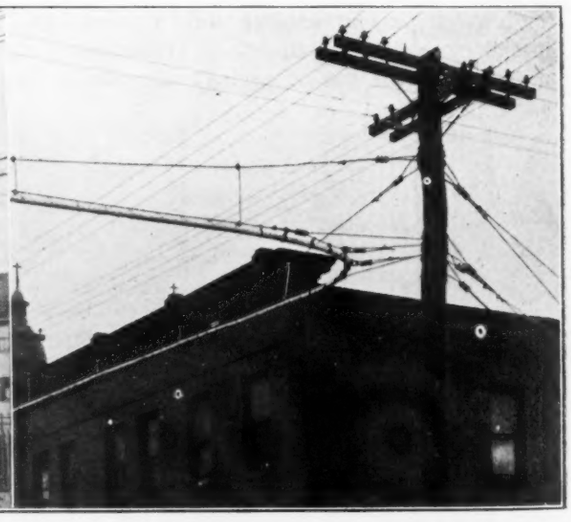


FIG. 6—CATENARY METHOD OF SUPPORTING CABLE

the top of the sheave being about 5 in. (12.7 cm.) below the messenger wire. On the four or five succeeding poles similar sheaves or cable rollers are placed. In feeding out the cable 2½-in. (63.5 mm.) S hooks, spaced 18 in. (45.7 cm.) apart, are fastened to it with small pieces of marlin tied in loop knots, as illustrated in Fig. 5. A lineman is stationed at each pole to change

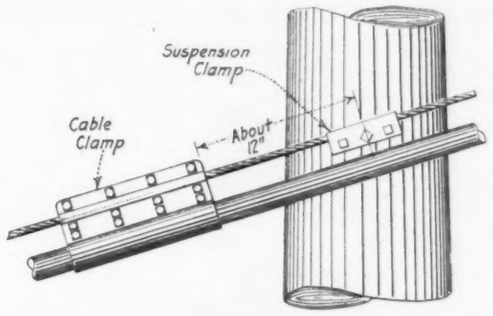


FIG. 7—CLAMP USED WHERE ANGLE BETWEEN CABLE AND THE HORIZONTAL IS MORE THAN 30 DEG.

the S hooks from one side of the pole to the other while the cable is being drawn into place. After the entire length of cable has been installed the S hooks, which were used only as temporary supports, are removed and permanent rings put in place. This operation is performed by a lineman supported on a boatswain's chair, which is moved along the section supported by the messenger wire. In pulling the transmission cable into place either a motor truck, horses, hand or power winch may be used.

No special means are employed in splicing the paper-insulated reinforced-rubber cable, but the usual precautions observed in the installation of underground cable must be taken into consideration. The jointing of any cable is more or less a matter of personal experience and great care must be exercised in all cases to exclude moisture. The work should be done carefully by a reliable and experienced workman and no splicing should be undertaken when weather conditions are unfavorable. Each conductor of the cable is insulated with black bias-cut varnished-cambric tape to a thickness about 30 per cent greater than the machine-applied insulation. Between each layer of tape is applied varnished-cambric insulating compound. After the individual conductors have been insulated a jacket of bias-cut black cambric tape, well painted between layers with an insulating compound, is applied to a thickness of 4/32 in. (3.18 mm.). Over the jacket of cambric tape several layers of the best-grade rubber tape to make a covering 5/32 in. (3.97 mm.) in thickness are applied. In applying the tape it is painted between layers with a good-quality rubber compound. After the joint has thus been made, it is entirely covered with three or four layers of friction tape well painted with rubber compound. The joint is then ready for the application of a soft-steel galvanized tape over which there are finally applied three or four layers of friction tape painted between the layers with a good quality of waterproof compound. To keep the cable in good condition it is necessary to paint it every four or five years with some form of insulating paint. This serves to keep the outside jacket from disintegrating and protects it from the action of the elements.

APPROXIMATE WEIGHTS AND DIAMETERS OF THREE-CONDUCTOR, 13,200-VOLT AERIAL CABLES

Size (B. & S gage or circ. mils)	Weight per Foot (Pounds)	Weight per Meter (Kg.)	Outside Diameter (Inches)	(Cm.)
No. 4	3.50	5.20	2.25	5.72
No. 2	4.05	6.02	2.41	6.14
No. 1	4.45	6.62	2.50	6.35
1/0	4.80	7.13	2.57	6.53
2/0	5.70	8.47	2.66	6.75
4/0	6.70	9.96	2.91	7.40
250,000 circ. mil	7.05	10.45	3.00	7.61
350,000 circ. mil	8.50	12.60	3.22	8.18

In the accompanying table are given the approximate weights and outside diameters of three-conductor cables, insulated for 13,200-volt operation.

Where it is necessary to make connection between an aerial cable and an underground system a standard form of lead-covered cable is used and installed in a lateral pipe. The joint between the underground and aerial cable is made up in the manner just described, and over it is slipped a lead sleeve one end of which is wiped to the lead-covered cable and the other end is well taped to prevent moisture from penetrating the cable.

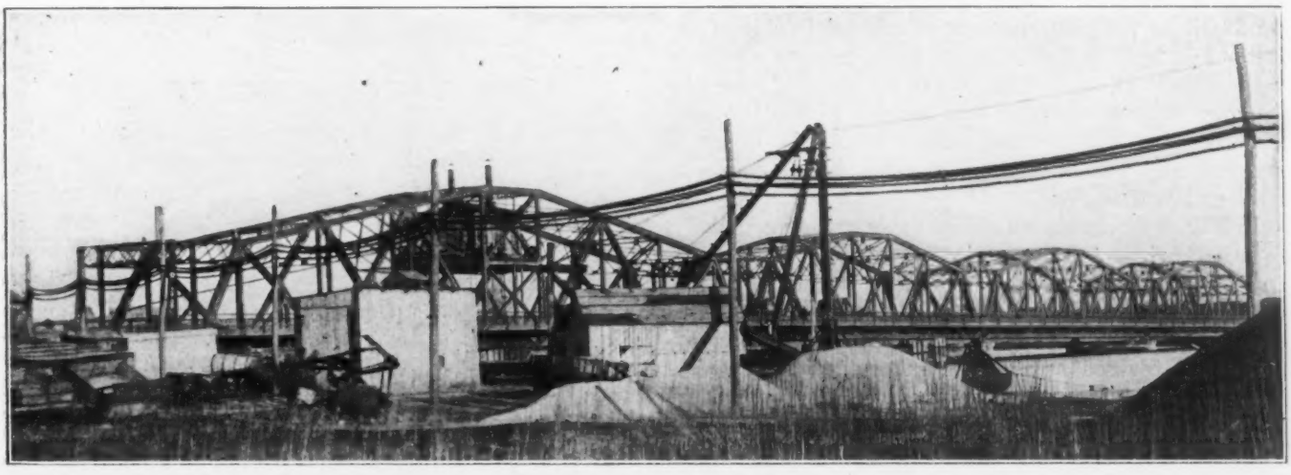


FIG. 8—INSTALLATION OF FIVE AERIAL CABLES WHICH HAVE BEEN IN SERVICE SIX YEARS WITHOUT A SINGLE FAILURE

Two aerial cables entering a power substation are shown in Fig. 4. In this installation iron pipe laterals are run up the pole and underground lead-covered cable is spliced to the aerial cable as just described.

It is customary in aerial installations to ground the messenger strand. Where the soil is dry or soil conditions unfavorable for grounding a ground connection

should be installed at every second pole. Where the earth is damp and soil conditions are favorable a ground should be installed at every fourth pole. In marshy ground and in places where conditions are particularly favorable a ground at every eighth pole will be sufficient. Where possible this ground connection should be well bonded to some metallic sub-surface structure. If this is not possible the standard artificial pipe ground should be installed.

It is also desirable that the steel tape on the cable be bonded to the messenger strand with bonding wire at every cable joint, as proper bonding is necessary in order to furnish the required protection against lightning. Where cable is run through trees and likely to be damaged it should be protected from abrasion by several layers of galvanized tape similar to that used in protecting the joint.

On steep grades where the angle between the cable and the horizontal is greater than 30 deg. the use of a clamp like that shown in Fig. 7 is recommended for securing the cable to the messenger. Clamps of this type can be made up as required and should be used on every fourth pole. The clamp is designed to take the greater portion of the down-hill pull on the cable, which otherwise would be carried by the cable rings.

Advantages of Catenary Method

A catenary method of installing aerial cable is illustrated in Fig. 6. The line represented was built to furnish 3000 kw. to a customer who required service within a few weeks after signing the contract. Within this short length of time it was impossible to obtain the standard aerial cable with reinforced-rubber insulation, so ordinary lead-covered cable was taken out of stock and used instead. Too great a strain would have been produced in the messenger wire and lead cable if the latter had been installed in the same manner as aerial cable usually is on account of the weight and long pole spacing. Consequently it was decided to use the catenary form of construction. As a result the strain is reduced and the transmission cable hangs perfectly level and without sag.

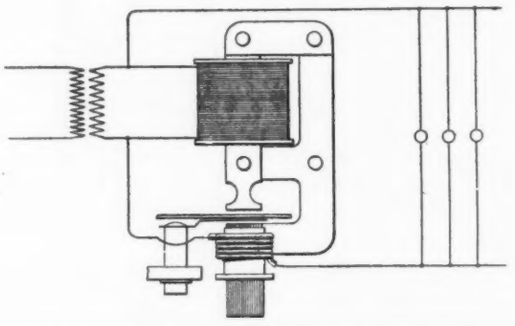
In Fig. 8 is shown an aerial cable crossing under a railroad bridge and electric railway power circuits. Open-air potheads or line terminals are employed to connect the cable and the open-wire transmission conductors. No protection in the form of lightning arresters is provided, as after a number of years of operation without failure from any source the cost of the installation of arresters seemed to be quite unwarranted.

Besides meeting the requirements imposed when a circuit has to be installed quickly, aerial cable also furnishes an ideal form of construction where line extensions have to be made over marshy ground which would require the use of foundation piling for a conduit line, over private property, such as railroad freight yards, trestles or bridges, where very special overhead construction would be necessary, or on important streets where open wires are not permitted and where subway construction would be expensive or impossible. While the installations described are operated at pressures under 15,000 volts such excellent results have been obtained with aerial cable that one large central station company has adopted this type of construction on all special work for operation at 26,400 volts.

FINDING TRANSFORMER LOSSES

Device for Measuring Total Energy Delivered to Transformer from Delivery Side

An exceedingly simple device for measuring the total energy delivered to a distributing transformer from its low-tension secondary side is the subject of patent No. 1,218,538, issued to Evan Evans and assigned to the General Electric Company. A magnetic yoke is provided with potential and series exciting coils tending to send flux across an air gap in which is placed the edge of a rotatable aluminum disk operating the recording wattmeter. By providing a metal vane of copper the magnetic flux of the yoke can be shielded so that the disk will rotate by virtue of the split-phase alternating field set up about the disk. Then, by adjusting the vane so that the disk records the no-load watt losses of the transformer when there is no current through the series coil, the meter can be made to register the aggregate load on the transformer from the delivery or low-tension side of the machine.

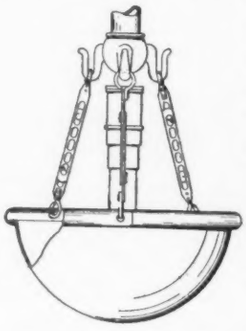


CIRCUITS THROUGH MEASURING INSTRUMENT

ADJUSTABLE ELECTROLIER

Extensible Two-Unit Supports Permit Adapting the Fixture to Any Size of Lamp

An adjustable electrolier for semi-indirect lighting is the subject of patent No. 1,204,044, granted to H. D. McFaddin of East Orange, N. J. Heretofore the supporting rods or spacing members have usually been rigid and of a definite length. With this construction there has been an obvious disadvantage in fitting a globe or shade to a fixture. Extensible rods are employed in the adjustable electrolier in the form of two units, one unit of each rod being attached to the shade-engaging member and the other unit to the lamp-supporting member. The units are adapted to overlap one another, and each unit is provided at its free ends with a hook-shaped tongue to engage with one of several apertures or slots in the other unit. No tools are required in adjusting the connection. Furthermore, if a fixture is installed for a lamp of a given size and it is subsequently desired to use a different form of lamp the change can be permitted by a simple adjustment of the shade-supporting members.



LIGHTING FIXTURE WITH ADJUSTABLE SUPPORTS

Plant to Serve 546-Mile Transmission Line

Methods of Solving Problems Involved in Building a Hydroelectric Plant in Mountains on a Site Fifty Miles from a Railroad

BUILDING a 63-mile (101.4-km.) transmission line from El Centro, Cal., to Yuma, Ariz., increases the total distance from generating plant to furthermost consumer on the interconnected lines known as the Southern Sierras system to 546 miles. The northernmost generating plant in this chain is in a latitude north of San Francisco, while the consumers furthest south are "somewhere in Mexico," as the system supplies energy wholesale to a Mexican company at the border line. Energy is also delivered to subsidiary corporations serving territory in Nevada. Altogether there are 1192 miles (1919 km.) of 55,000-volt lines on the one system.

In order to supply the present and prospective needs of the territory thus served, the Pacific Power Corporation, which is associated with the Nevada-California Power Company and the Southern Sierras Power Company, recently undertook the development of additional power on Rush Creek. The first unit of this plant, which is now in operation, utilizes water stored in Gem and Agnew Lakes and feeds the main transmission line about 60 miles (96.5 km.) north of Bishop, Cal. At present the new plant is supplying 5000 kw., and its capacity will be doubled in the near future by a duplicate unit.

Still another 10,000-kw. plant is projected for a site

FIG. 1—POSITION OF STORAGE PONDS AND COURSE OF PIPE LINE INDICATED IN WHITE

20 miles (32.2 km.) further north on Leevining Creek, where a total of about 1700 ft. (518 meters) of head will be available, utilizing storage developed on Rhinedollar, Tioga and Saddlebags Lakes.

Transportation difficulties constituted one of the chief problems on the Rush Creek development from the very outset. The first task was the building of a wagon road for practically the entire 56 miles (90.1 km.) from the nearest railroad to the power house. This work cost about $40,000. With the completion of the road six caterpillar tractors were put in service. Each tractor drew a three-wagon train, the total capacity of the three trailers being 29 tons (26.3 metric tons). Under normal running conditions these trains made the round trip between railroad and power house in seven days. Altogether about 5000 tons (4540 metric tons) of freight were hauled over this road in 1915 and 1916.

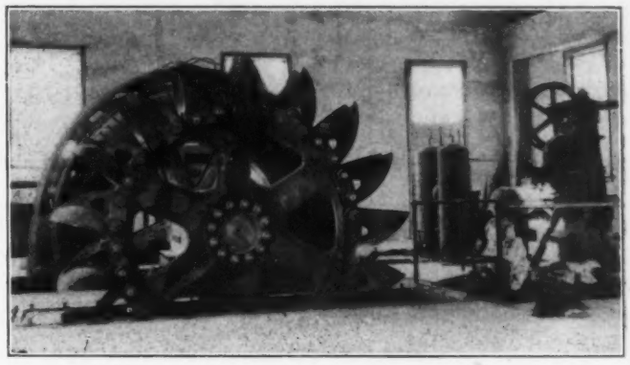


FIG. 2—IMPULSE WATERWHEEL DESIGNED TO OPERATE UNDER TWO DIFFERENT HEADS

After delivery at the power house materials to be used at the upper dam had to be drawn up an incline, shipped across a lake on barges, and then reloaded for conveyance on a second incline. This made cement cost $7.60 per barrel delivered, and the contract price for concrete in place, exclusive of excavation, was $22 per cubic yard ($34.70 per cubic meter).

The upper dam is at an elevation of 1800 ft. (548 meters) above the power house. In building the incline to deliver freight to the dam it was found that, owing to the irregularity of the slope, about 40 per cent of the line would have to be supported on trestle. The trestle bents were built up of logs cut near the site, and rails were laid on stringers made of heavy rough-hewn logs.

The maximum grade on this incline is 67 per cent, and it was necessary to use curves of sharp curvature, the minimum radius being about 75 ft. (22.8 meters). The incline is divided into two sections. The first 4800 ft. (1461 meters) length is operated by a 100-hp. electric hoist near the Agnew dam site. From there cars can be lowered for 500 ft. (152.3 meters) to Agnew Lake. After a half-mile trip across the lake the journey to the upper dam is finished on another incline, 2200 ft. (670 meters) long, also operated by an electric hoist installed at the top.

A feature of the incline which required special study is a 32-deg. curve which it was necessary to install where the intersection of a 60 per cent and a 37 per cent grade left the angle point considerably below relative grade. Special provision was required at this point in order that the hauling cable should maintain its position. A

3½-ft. (1.066-meter) sheave was for this reason mounted on an inclined axle 3 ft. (91.4 cm.) from the inner rail of the curve. While the car is below this point, the cable runs round this sheave, having been automatically seated upon it by converging guides shod with iron.

Two dams have been constructed, one at Gem Lake and one at Agnew Lake. Both dams are of the multiple-arch type, designed by Lars Jorgensen of San Francisco, who also supervised their construction. Gem Lake Dam, impounding 16,000 acre-feet (19.7×10^6 cu. meters), has a drainage area of 22½ square miles (58.3 sq. km.) and is 675 ft. (206 meters) long. The maximum height of the dam is 84 ft. (25.6 meters), exclusive of a 28-ft. (8.5-meter) depth to which it was found necessary by the builders to carry foundations at one point.

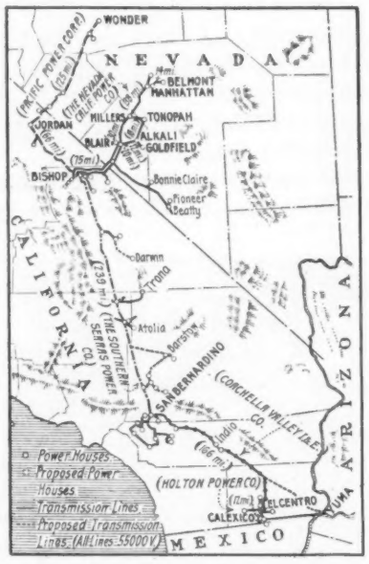


FIG. 3—TERRITORY COVERED BY SOUTHERN SIERRAS SYSTEM

The dam at Agnew Lake will be of practically the same design as the Gem Lake structure, but will be shorter and have a maximum height of 30 ft. (9.2 meters). It is about 550 ft. (167.5 meters) lower in elevation than the upper dam and has a storage capacity of 900 acre-ft. (1.1×10^6 cu. meters). An area of about 1⅝ square miles (4.21 sq. km.) will drain into this lake, and any surplus from Gem Lake is directly tributary, thus utilizing it as an auxiliary for Gem Lake storage.

When the installation is completed there will be two 5000-kw. waterwheel generators. One unit is now installed. It is designed for efficient operation when working under either the 1250-ft. (381-meter) head available from Agnew Dam or the higher head from Gem. The other unit will be designed for operation under the 1800-ft. (548-meter) head. Each unit will be supplied from a separate pipe line running to a Y-piece 500 ft. (152 meters) below Agnew. Through this Y they are connected to a 48-in. (122-cm.) steel pressure pipe line from Gem Lake. One line is also connected with the Agnew outlet by a 30-in. (76.3-cm.) line fitted with valves so that water can be drawn from either source for the variable head machine. The duplicate lines are 30 in. (76.3 cm.) in diameter at the top and 28 in. (71.1 cm.) in diameter at the power house, the thickness varying from ¼ in. (6.35 mm.) to 15/16 in. (23.81 mm.). These pipes, which are of lap-welded steel, were made in 20-ft. (6.1-meter) lengths. The first line has been installed and is now in service. After delivery at the power house the pipe sections were lashed to the incline car and on arriving at the proper level were swung over into position on the pipe line while supported from an anchorage above. The pipe line has a maximum grade of about 60 per cent.

To carry the thrust in the pipe line concrete abutments were built at frequent intervals, usually at changes of grade. At these points clamps encircle the pipe just below a joint, and these clamps in turn bear against vertical iron rails embedded in the concrete abutment. After the pipe has been put in place the concrete abutment is built around the pipe, care being taken to keep the joint free for calking.

Standard Equipment Installed

Because of the remote location of the plant and the cost of special attention in emergencies simplicity of operation was a primary consideration. Consequently standard electrical equipment was used wherever possible. The power house proper, which has already been completed, now contains one unit. The second unit is to be put in while the second pipe line is being built. The first unit consists of a Pelton-Doble impulse wheel driven by a 7¼-in. jet from a needle-regulated nozzle actuated by an oil-pressure governor. The generator already installed is a three-phase, 60-cycle, 2300-volt machine of standard General Electric pattern. Two 60-kw., 125-volt exciters are installed, one being provided with motor drive on one end of the shaft and with an impulse wheel on the other end. The other unit is water-driven only. The switchboard, voltage regulator and 87,000-volt aluminum lightning arrester are also of standard pattern. The three 3000-kva. transformers are of the water-cooled type and are placed outdoors.

The dams have been constructed under a contract with the Duncanson-Harrelson Company of San Francisco. Contracts for the pipe lines were awarded to the M. W. Kellogg Pipe Company of New Jersey and the Llewellyn Iron Works of Los Angeles respectively. C. O. Poole has been in charge of the design and construction throughout the entire development as chief engineer of the Pacific Power Corporation.

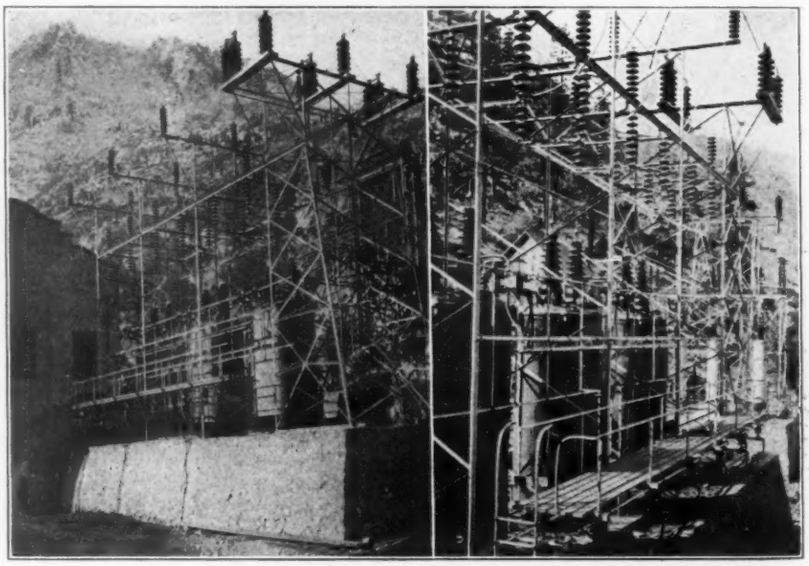


FIG. 4—OUTDOOR WATER-COOLED TRANSFORMER INSTALLATION

ANALYSIS OF OPERATING COSTS

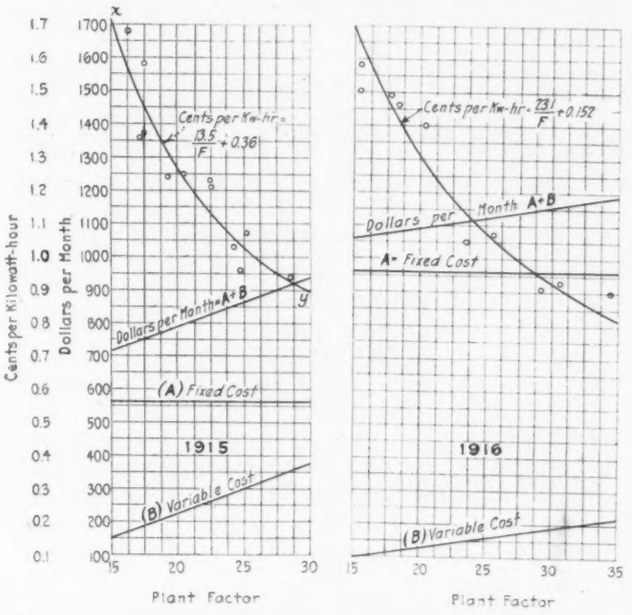
How Total Operating Expenses May Be Separated Into Fixed and Variable Expenses by Graphical Analysis

BY ARTHUR JOBSON
Casper, Wyo.

For a given power plant operating under normal conditions the unit cost of generating electrical energy varies inversely as the kilowatt-hour output. When the total monthly or yearly operating expense is assumed to vary directly as the output, and uniformly therewith, the expression for the unit cost may be represented by

$$U = a/F + b \qquad (1)$$

in which U is the cost in cents per kilowatt-hour, F the plant factor in per cent (*i.e.*, the ratio of the mean load for any period of time to the aggregate generator rating multiplied by 100), and a and b constants.



FIGS. 1 AND 2—COST OF ENERGY DELIVERED TO THE SWITCHBOARD AT DIFFERENT PLANT FACTORS

If R = aggregate generator rating in kilowatts, h = number of hours operated, and C = operating expense in dollars during the period of h hours, then, substituting in equation (1), $C = [(a/F + b) \times h \times F/100 \times R] \div 100$, or

$$C = hR(a + bF)/10^4 \qquad (2)$$

In this expression $hRa/10^4$ represents the fixed operating expense in dollars for the period considered, and $hRbF/10^4$ represents that part of the operating expense varying with the station output.

From these relations it may be seen that if the actual unit production costs are available and the unit costs are made to conform with equation (1), the total operating expense may be separated into two components, one component being the fixed operating cost and the other that part of the operating cost varying directly with the kilowatt-hour output. The relative proportions of these costs will be characteristic of the particular type of plant and the conditions under which it may have been operating during the period covered by the analysis. This method of analysis is not only applicable to the total operating expense, but any part of such expense, as, for instance, the determination of the relative proportions of the fixed and variable expense required for fuel used in operation.

APPLYING THE METHOD

Applications of this graphical method of analysis to actual data obtained from the operation of a small electric plant are represented in Figs. 1, 2 and 3. The small circles platted in Figs. 1 and 2 indicate average monthly switchboard production costs in cents per kilowatt-hour for the year 1915 and the first ten months of 1916 respectively. Fig. 3 applies similarly to the cost of fuel in the operation of the same plant. The unit cost curve xy in Fig. 1 was determined in the following manner:

The twelve months of the year were divided into two groups, one group consisting of the six months having the lowest unit production costs, and the other group including the six months of highest similar costs. For each group the number of hours, kilowatt-hours generated and operating expense in dollars were totalized. From these the average unit cost and corresponding plant capacity factor in per cent were obtained for each group. These values determined the location of two points on the mean unit cost curve xy, and thus permitted calculation of the constants a and b in equation (1), after which the curve was plotted as shown. The corresponding curves in Figs. 2 and 3 were determined in a similar manner. Equation (2) was then used to determine the average monthly variation in operating expense for corresponding plant factors within the range of the station output in kilowatt-hours. These expenses are represented in the chart by means of straight lines.

Space does not permit a very thorough discussion of these curves. They indicate a relatively larger component of fixed operating expense than would be expected, even for the cost of fuel. It may be pointed out that the total expense in dollars does not include such fixed charges as interest on the investment, depreciation, insurance, etc. The excessive fixed operating expense during the first ten months of the year 1916 may be attributed partly to the higher wages paid both for operation and maintenance and in part to a larger expenditure than is necessary under ordinary conditions for replacements.

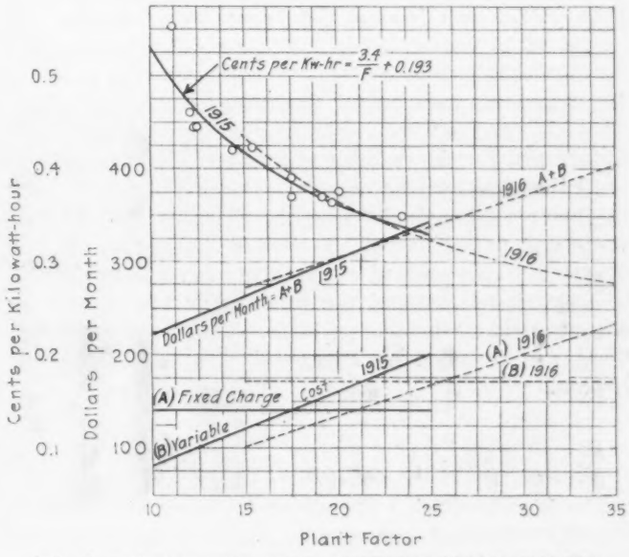


FIG. 3—COST OF FUEL WITH DIFFERENT PLANT FACTORS

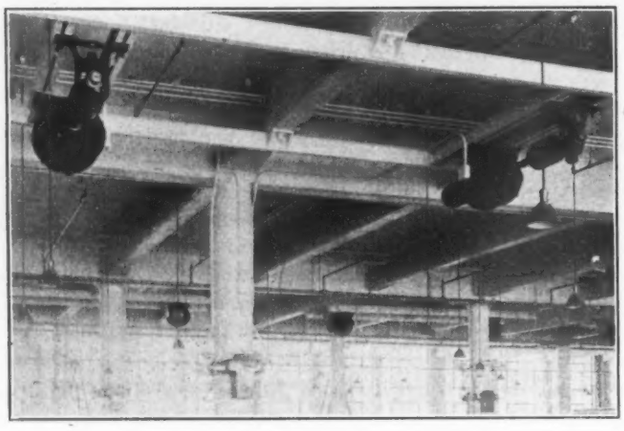
STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

MOUNTING SWITCHES ON POSTS

Bolts Set in Columns Before Concrete Was Poured Prevent Possibility of Switch Rocking

Rugged mountings for motor switches on concrete columns were secured by the method shown in the accompanying illustration in the Naumkeag Steam Cotton Company's mill at Salem, Mass. When the columns



HOW SWITCHES ARE MOUNTED ON CONCRETE POSTS

were poured two 6-in. (15.2 cm.) by ½-in. (12.7 mm.) iron bolts were set horizontally in the columns, one above the other, 3 in. (7.6 cm.) apart, with their heads in the columns and the threaded portion protruding 1 in. (2.54 cm.) beyond the face of the column. By means of these bolts 5-in. (12.7 cm.) by ½-in. (12.7 mm.) wrought-iron plates, to which the oil switches for the motors were bolted, were secured on the columns. The iron plates were made long enough to furnish a proper seat for the switch and then were bent in radially until they touched the column. This construction helps the column bolts in holding the plate firmly and prevents any possibility of the switch rocking when it is operated. This method of mounting is much preferable to using bands around the columns or to a mounting arrangement on expansion bolts. The electrical equipment was installed by Lockwood, Greene & Company, Boston.

Saving Copper Tie Wires

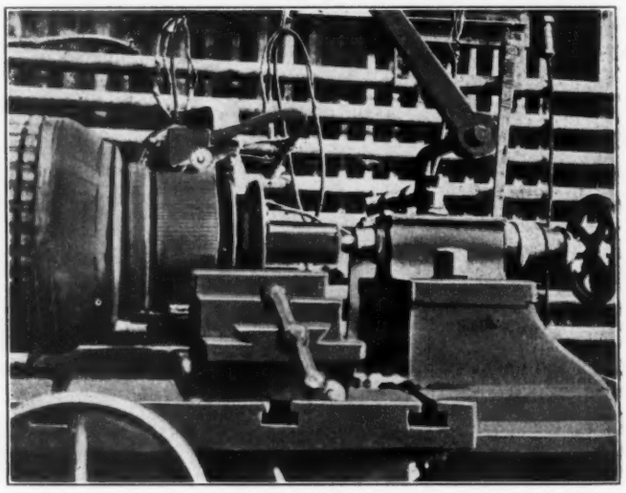
The Lincoln (Neb.) Telephone & Telegraph Company recently estimated how much is wasted on line construction in throwing away copper tie wires. On a thirty-wire pole line are thirty tie wires each 19 in. (48.36 cm.) long, equaling 47.5 ft. (14.5 m.) per pole. Since there are about thirty-four poles per mile, the corresponding aggregate length of the wires would be 1615 ft. (491.2 m.). Since 32 ft. (9.75 m.) of No. 12 N.B.S. gage copper wire weighs 1 lb. (0.45 kg.), 1615 ft. (491.2 m.) or 50 lb. (22.7 kg.) at 31 cents per pound (69 cents per kg.) (junk value) would cost $15.50 per mile of line ($9.63 per km.). The company now sends a man out to follow wiring gangs and pick up the scrap pieces of wire. While fewer tie wires are used per mile of transmission line this example should serve to show how important it is to save scrap wire.

SLOTTING COMMUTATORS RAPIDLY

Motor with Milling Cutter on End of Shaft Mounted on Sliding Frame at the Back of the Lathe

A lathe attachment has been developed in the shops of the Knoxville (Tenn.) Railway & Light Company with which it is possible to turn and slot an average-size motor commutator in about fifteen minutes. It consists of a motor-driven milling cutter mounted over the center line of the lathe in such a manner that the cutter may be used to slot the commutator of a motor held in the lathe. The motor is mounted on a sliding frame which is attached to the lathe carriage at the back of the lathe. The lever shown is also mounted on the carriage, and is so connected to the motor that by moving it the motor is slid 5 in. or 6 in. (12.7 cm. or 15.24 cm.) up or down the lathe.

The cutting wheel which is mounted on the shaft of the motor is brought in line with the center of the lathe by means of the hand wheel on the carriage. It is lowered so as to cut the proper depth by a screw under the motor. The carriage is shifted up or down to get the stroke of the cutting wheel to end at the proper point on



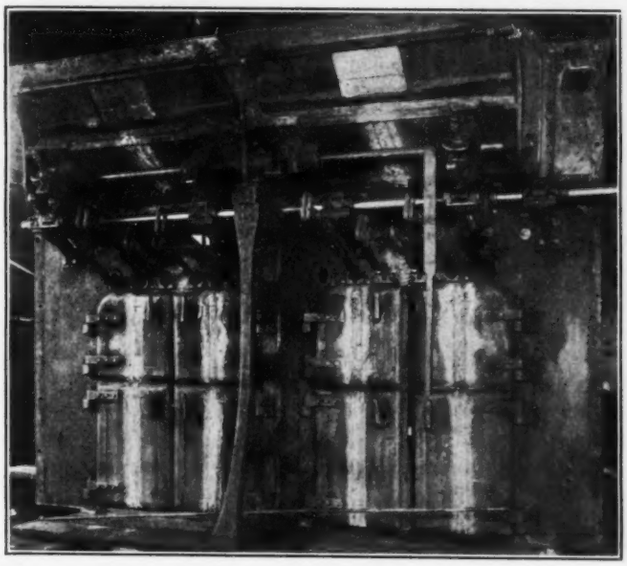
MILLING CUTTER DRIVEN BY MOTOR AT REAR OF LATHE

the commutator. One movement of the lever cuts the entire length of the commutator bar. The lever is returned and the next mica is brought in line with the cutting wheel. For removing copper dust, air is blown through the pipe shown just on the right of the cutting wheel. The armature is turned and slotted and also banded without removing from the chuck.

REDUCING CONSTRUCTION AND MAINTENANCE COST

How an Acetylene Gas Burner Was Used by an Indianapolis Company to Remodel a Stoker and Reduce Expense of Steam Mains

When the Merchants' Heat & Light Company of Indianapolis, Ind., recently needed a 7-ft. 6-in. (2.29 m.) stoker for one of its stations it effected a considerable saving by cutting down and using an 11-ft. (3.35 m.)



FRONT OF 7.5-FT. STOKER MADE FROM 11-FT. STOKER

Westinghouse-Roney stoker that happened to be on hand. The cutting-down process was accomplished by taking two 21-in. (53.3-cm.) sections out of the 11-ft. (3.35-m.) unit. It was necessary to remove the excess width in two sections rather than one, so that the doors and bearing bars would remain symmetrically placed.

The labor and materials required in cutting, welding and reassembling the stoker cost $134.50. The cost of the 7-ft. 6-in. (2.29-m.) unit, installed, including a new grate and dump bars, changes in the ash pit, and relining of the boiler setting, was $750. The purchase price of a similar type of stoker new would have been $2,250, excluding cost of installation. The work was supervised by M. L. Addington, the company's superintendent of power plants.

The application of gas welding has also permitted the company to effect a saving in laying a 2660-ft. (81.1-m.) steam-heating main extension. For this line, which will consist of 12-in. (30.5-cm.), 10-in. (25.4-cm.), and 8-in. (20.3-cm.) pipe laid in wood-log insulation, the pipe has been purchased in 40-ft. (12.2-m.) lengths; that is, pieces twice the usual length. Use of such long sections was practicable since less turning and handling of the pipe is necessary with welded-joint construction than with other types. The ends of these pipes are beveled. To make a butt weld between two 12-in. (30.5-cm.) pipes with square ends requires about one hour. A weld between two beveled pipes of the same size can be made in about one-half hour, effecting a saving both in labor and in gas. The extra time consumed in welding square-end pipes is taken in beveling the abutting edges to form a V-shaped groove, so that the weld will extend entirely through the pipe. This welded steam-line construction, it is said, will effect a reduction in cost and give a better line, since there will be fewer joints and less likelihood of leaks. The contract for this extension, which will amount to $20,000, was awarded to the American District Steam Company, Chicago.

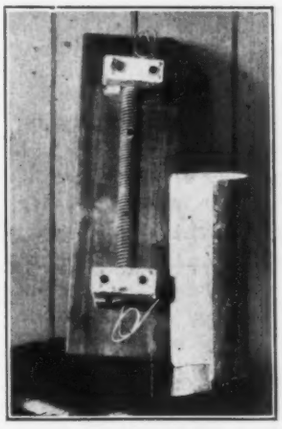
In repairing steam-heating mains, the company has adopted the practice of cutting a 3-ft. to 5-ft. (91.4-cm. to 152.4-cm.) section out of the defective main and welding in a new piece with acetylene gas. Taking into consideration the lesser excavation and material costs, this method is less than one-half as expensive as replacing an entire length of pipe.

Gas is also used in welding service nipples to both steam and hot-water mains. According to the operating company, it is cheaper to weld a nipple to a pipe line and cut a hole in it with acetylene than to cut the main and insert a T. In hot-water systems the welded nipple makes a better job than a nipple inserted in a drilled and tapped hole, since the inner end of the latter obstructs the flow.

ELECTRIC HEATER TO KEEP PIPES FROM FREEZING

Exposed Cooling-Water Pipe Leading to Transformers Is Protected in Winter by the Use of Home-Made Heaters

At one of the hydroelectric plants of the Cumberland County Power & Light Company of Portland, Me., cooling water for the main transformers is piped from the wheel casings in the generating station across the tailrace to a transformer house. The piping is housed in a wooden casing covered with tarred felt, but the outdoor location exposes it to severe weather. To prevent freezing, 32-cp. carbon lamps were installed with the duct about 2 ft. apart, with their axes placed horizontally. When surges occurred on the transmission lines of the system, however, trouble was experienced from burning out of lamps. To secure more reliable service, L. G. Scott, head of the underground-distribution department, designed a simple but effective heating unit of No. 13 gage iron wire, shown herewith.



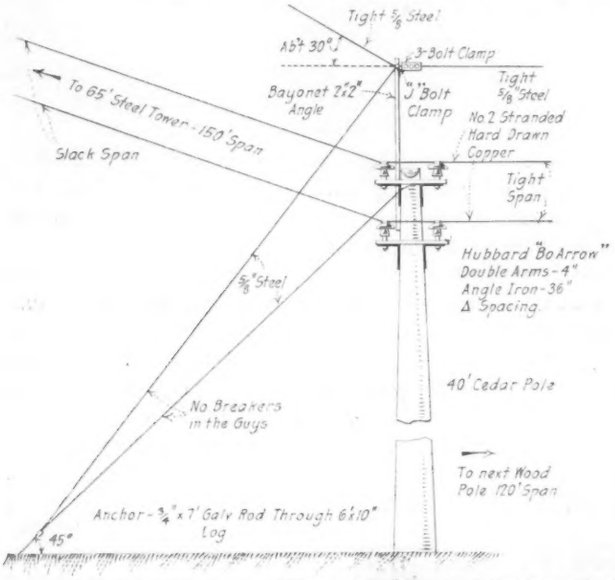
ELECTRIC HEATER FOR PIPE

Each unit was made by winding a wire closely on a ½-in. (12.7-mm.) pipe. The turns were then slightly spread apart and the ends of the helix, which is about 15 in. (38.1 cm.) long, are held in No. 3 B. & D. porcelain cleats. The units are installed 2 ft. to 3 ft. (61 cm. to 91 cm.) apart, each being provided with a semi-cylindrical galvanized-iron reflector which serves to reduce the radiation and by maintaining a higher coil temperature cut down the energy consumption. Twenty-four units are run in series from a 110-volt or 220-volt supply, according to the severity of the weather. At 220 volts the series of resistors draws 20 amp. The diameter of the circulating-water pipe is 2½ in. (6.35 cm.), and the wooden duct is about 12 in. (30.5 cm.) square in cross-section.

CONSTRUCTION FEATURES OF A POLE AND TOWER LINE

How a Cleveland Company Combined to Advantage Cedar Poles and Steel Towers in Building on Railroad Right-of-Way

In building a three-phase, 22,000-volt transmission line between Cleveland and Bedford, Ohio, the Cleveland (Ohio) Electric Illuminating Company has used to advantage a combination of cedar poles and steel towers. For the general run of the line, which is on a railroad right-of-way, 40-ft. (12.2-m.) poles gave sufficient height. At several places, however, cross leads, overhead bridges, etc., required that the line wires have 50-ft. (15.2-m.) clearance above ground. For these high crossings the company used in the line two or more steel towers averaging 65 ft. (19.8-m.) above the foundations. There has been produced, therefore, a line consisting of several stretches of wood poles with intermediate stretches of steel towers. The spacings average 120 ft. (36.6-m.) between poles and 330 ft. (100.6-m.) between towers. The line wire is No. 2 stranded, hard-drawn copper, and the ground wire 5/8-in. (15.9-mm.) Siemens-Martin galvanized strand.


Tight 5/8 Steel
Abt 30°
3-Bolt Clamp
Bayonet 2½" Angle
"J" Bolt Clamp
Tight 5/8" Steel
No 2 Stranded Hard Drawn Copper
To 65' Steel Tower - 150' Span
Slack Span
Tight Span
Hubbard "Bo Arrow" Double Arms - 4" Angle Iron - 36" Δ Spacing
5/8" Steel
40' Cedar Pole
No Breakers in the Guys
To next Wood Pole 120' Span
Anchor - ¾" x 7' Galv Rod Through 6x10" Log
45°

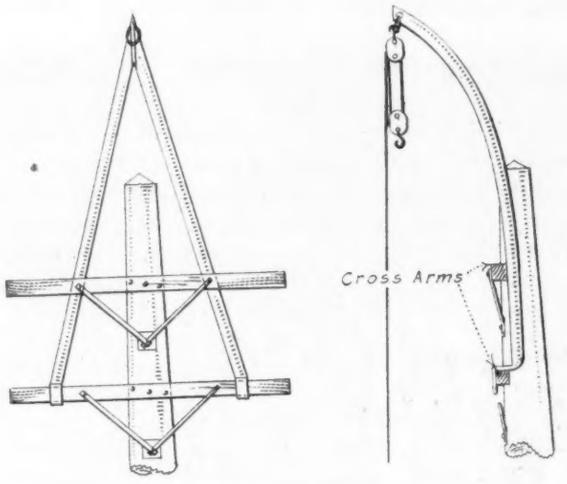
CONSTRUCTION USED AT A WOODEN POLE AT THE END OF ONE OF THE SECTIONS OF THE LINE

Where the line changes from poles to towers or the reverse, the wires make an angle of as much as 30 deg. with the horizontal, on account of the difference in height. To form a rigid construction the company's engineers considered the tower sections of the line and the wood-pole sections as independent units, double-arming the end poles and end towers of each section and connecting between them with a comparatively slack span. For this purpose the end poles were head-guyed to an anchor and a head guy was also brought down from the ground-wire bayonet to the same anchor, which served also as an additional grounding point for the ground wire, as no breakers were used in any guys. This method allowed the line to be built in independent sections, as the towers were placed after the wire was strung on the pole sections, and time was an important factor. Also it eliminates most of the down-strain on towers, due to wire tension, and the up-strain on pole insulators and ground-wire bayonets. With this construction the wires will not pull off insulators.

CRANE TO RAISE TRANSFORMERS

Pole-Top Crane Made of Pipe That Is Designed to Lift 25-Kw. Units

In the accompanying illustration is shown a method by which the Kingsport (Tenn.) Light & Power Company raises its transformers on poles. A 2-in. pipe bent as shown has been used effectively in raising transformers as large as 25 kw. The diagram shows clearly the shape of the device, and the method of mounting on cross-arms in such a manner as to hold the crane steady while it is in use.



METHOD OF RAISING TRANSFORMERS ON POLES

CONVENIENT RACK FOR PIPE

Made of Scrapped Boiler and Condenser Tubes at a Relatively Small Expense

The pipe rack shown in the accompanying illustration, built by James A. Shepard of the Deming (N. M.) Ice & Electric Company, has been found a convenient way to store all plant piping in its various sizes and lengths. The rack is constructed of scrapped boiler tubes and split tubes from an ammonia condenser. The construction is evident from the illustration. The horizontal tubes are simply flattened at the ends and bolted to the uprights, making a structure 9 ft. by 24 ft. (2.74 m. by 7.32 m.). This rack is just at the rear of the plant and was built by the plant repair men in spare time. The total cost for labor was between $15 and $18. The cost for material was $2 for the galvanized iron roof and $3 for bolts.

STRUCTURE DESIGNED BY NEW MEXICO COMPANY FOR HOUSING POWER PLANT PIPING

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

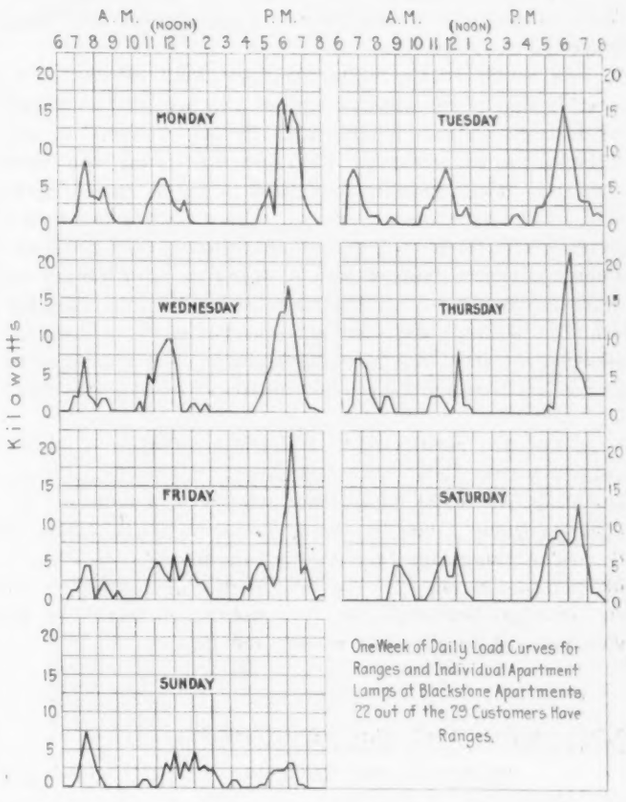
THE CHARACTERISTICS OF APARTMENT RANGE LOAD

Contrary to Conditions Existing in the Average Home, Peak Load Comes on Between 5 and 6.30 P. M.

Speculation regarding the effect of a large electric range load on the central station load curve still exists. There is a definite feeling that the maximum range demand will be a large percentage of the range-connected load and that the peak may come during the station peak. From the standpoint of rates for electric cooking this is, of course, a very important factor.

The conditions that may well be expected from apartment house range loads were touched on by R. B. Snyder, sales manager of the Milwaukee Electric Railway & Light Company, in a paper recently delivered before the Wisconsin Electrical Association. Mr. Snyder showed that while the individual maximum demand of single ranges may average between 40 per cent and 60 per cent of the connected load, the maximum demand for a group of twenty-five ranges will not exceed 15 per cent of the connected load. He stated that when the electric range comes into general use among all classes of customers, if the experience with gas cooking in the average city may be drawn upon, the peak load for cooking will occur between 11.30 a. m. and 1 p. m.

Range installations in apartment buildings, it was


A. M. (NOON) P. M.
6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
Kilowatts
0 5 10 15 20

One Week of Daily Load Curves for Ranges and Individual Apartment Lamps at Blackstone Apartments. 22 out of the 29 Customers Have Ranges.

TEST ON RANGES AND LIGHTS AT BLACKSTONE APARTMENTS, MILWAUKEE. TWENTY-TWO OUT OF TWENTY-NINE CUSTOMERS WITH RANGES

Apartment No.	Number Active Rooms	Connected Load, Watts	February—Daily Kilowatt-Hours Consumption										Total Kw.-hr. per Customer	No. of People	January 1917, Kw.-hr.
			7 Wed.	8 Thursday	9 Friday	10 Saturday	11 Sunday	12 Monday	13 Tuesday	14 Wed.	15 Thursday	16 Friday			
1	3	800	0.3	0.2	0.5	0.1	0.6	0.4	.0	0.8	0	0.8	4.2	2	13
103	1	0.400	1	2	1.6	4.3	2.3	1	1.5	2.5	1	1.2	18.4	2	51
107	2	3.700	1	0.5	1.4	1.2	1.7	0.8	1.7	0.7	0.8	0.5	10.5	2	47
108	2	3,400	2.1	2.8	1.2	1.9	2.6	0.7	5.9	2.6	1.8	1.7	23.4	2	62
110	3	5,300	4.4	3.9	1.7	4.2	5.5	2.3	1.3	3.8	3	3	33.1	3	97
112	1	5,400	2.7	2	3	1.5	3.5	1.3	8.3	21	5.4	5	34.8	2	169
111	3	5,300	6.7	4.2	5.9	6.4	5.3	8.4	0.3	5.5	6.3	9.4	58.4	4	..
203	2	300	0.6	0.3	0.6	0.1	0.5	0.3	3	0.7	0.5	0.3	6.9	1	15
205	2	4,300	2.9	2.8	3	5.7	2.7	4.9	3	3.7	2	4.2	34.9	3	..
206	2	4,800	2.7	2.5	3.8	3.8	4.7	4.3	6.7	2.1	3	2.4	39.0	3	126
207	2	3,800	0	0	0	0	0	0.3	0	0	0	0	0.3	1	71
208	2	3,700	2.2	3.4	3.7	2	2.3	0.3	1	2.5	3.5	2	18.9	2	78
209	2	3,900	3.3	3.4	3.6	6.4	4.3	1.3	2.9	2.6	3.2	2.2	33.2	3	150
301	1	150	0	0	0	0.4	0.3	0.2	1	0.4	0	0.5	1.9	1	14
303	1	100	0.4	0.1	0.1	0.7	0.4	0.2	0.4	0.3	0.4	0.8	3.8	2	7
212	2	4,800	3.3	3.2	5.1	10	4.2	3.2	0.4	7.9	8	6.9	50.4	4	..
306	2	5,100	0	0	0	0	0	0	0	0	0	0	0	2	9
307	2	3,600	2.5	2.5	5.3	2.4	4.5	1.1	3.7	3	2.3	4	31.3	2	46
308	2	5,100	4.2	4	1.3	2.3	1.4	1.5	1.5	1.5	1	1.8	15.5	2	..
309	2	3,400	3.3	4.3	2.7	2	0.6	4.7	0.5	3	3.7	4	18.5	3	..
312	2	4,500	2.5	2.8	4	1.7	0.5	2.3	0.3	4.3	3.5	3.2	25.1	2	32
401	2	160	0.5	0	0.6	0.5	1	0	0.4	0.6	0.3	0.5	3.4	1	8
403	1	150	0	0.2	0.2	0.2	0.3	0.5	0	0.1	0	0.2	1.7	1	7
405	3	4,300	3.2	2.7	3	3.6	2.2	2	2.9	1.3	2.2	4.6	27.7	2	..
406	2	5,105	2.5	2.8	6.7	3.7	2.7	1.6	2.9	7.2	6.5	5.3	41.9	3	114
407	2	3,395	2.1	0.8	0.5	1	2.3	0.8	0.4	1.3	1.3	1.2	11.7	2	101
408	2	3,590	0	1.3	1.1	0.9	1	0	0	0	3.2	2.5	10.0	1	25
409	2	5,590	2.7	2.3	3.5	2.1	5.2	4	5	4	4.2	2.2	35.2	3	159
412	2	4,500	0	0	0.1	0.2	2.3	3.1	4.7	7.2	6.5	5.3	29.4	2	182
Total		97,140	52.8	49.3	60.5	64.2	68.4	54.5	64.9	73.7	73.6	76.7	733.6	....	..
Maximum demands			16.8	21.4	22.8	13.2	7.2	16.8	15.6	18.7	17.9	19.2	....	....	..
Load factor per cent			13	9.6	12	20.3	39.5	17	13.5	16	17.1	16.7	....	....	..

Average kw.-hr. per customer per day, 2.5. Average kw.-hr. per person per day, 1.18.

pointed out, cause entirely different load conditions from those in the average home. A large diversity factor is obtained with apartment installations, but the peak load occurs between 5 p. m. and 6.30 p. m. This seems to be the experience quite generally. As the apartment building falls easiest prey to the many charms of electric cooking, Mr. Snyder felt it to be likely that the initial loads caused by such installations in large cities will not represent, on the average, conditions which will prevail when all classes are using the service for cooking.

The seven curves show the day load curves of an installation of twenty-two ranges and necessary lighting at the Blackstone Apartments in Milwaukee. It was impossible to separate the lighting from the total demand. Considerable variation is noted from day to day in the maximum demand, which occurs between 5 p. m. and 6.50 p. m., except on Sunday. The average demand for the week was 16.3 kw., caused by a connected load of 97.14 kw. The greatest demand was 22.8 kw. and the smallest was 9.2 kw. on Sunday. The average diversity factor for the week was 6.7. The average load factor of the twenty-two installations for one week was 17.8 per cent.

A ten-day record of individual operation of these ranges is contained in the accompanying table, showing the daily variation in kilowatt-hours and demand for each customer, together with a record of the number of active rooms and persons in the family. The daily use per person of 1.18 kw.-hr., including lamps, shows the average consumption for cooking purposes to be well below 1 kw.-hr. per person per day.

COLLECTING $50,000 AFTER RECORDS WERE DESTROYED

Placing Absolute Reliance in Honesty of Customers Results in Loss of Only 10 Per Cent of Amount Due for Both Service and Merchandise

BY C. ERWIN

Auditor Decatur (Ill.) Railway & Light Company

Fire completely destroyed the office of the Decatur (Ill.) Railway & Light Company some time ago, and the conflagration spread so rapidly that it was possible to save only the cash, the general ledger and some less important books. All records of accounts against customers and records of meters installed were lost owing to the fact that the fireproof safe containing them fell into a pile of burning coal in the basement and in that position was hit by another safe that fell from the floor above it. The general ledger, to which accounts are posted once a month, showed that customers owed the company $50,000, but there were absolutely no details to assist in accounting for that amount.

To re-establish the company's records a conference of all employees who knew anything about meter reading was called. From these men a crew of twelve was picked to make a house-to-house and building-to-building canvass. A card index covering every house in the territory of the company was first made, regardless of whether the house was served or not. These cards were kept in a temporary file until it was established whether or not the house contained a meter. Then the cards, signed by an inspector, were transferred to a permanent file and were arranged alphabetically by street and by house numbers. This helped locate accounts quickly. From these permanent cards new meter ledgers were made up.

Frank Appeal for Assistance in Time of Trouble

While the house-to-house canvass was in progress the company conducted a newspaper advertising campaign, acquainting the people with conditions at its office and appealing to them to give canvassers all information sought. A regular bill, paid or unpaid, for March, the month before the fire, was what was wanted. From this it was possible to get the last meter reading and to establish a basis for future billing. The canvassers asked for these bills and gave customers receipts for them to hold until the bill was returned. The canvassers also asked if customers had merchandise accounts and secured the last statement delivered on these if possible. The whole thing was put squarely up to the honesty of the people. If a customer said his March bill was paid, the company took his word for it, even though he had no receipt. The only exceptions to this were with accounts where some employee of the company knew positively from memory that some bill was unpaid.

In assigning canvassers to this work the company put two men on a street, one on each side. To avoid complications at corner houses the canvasser was instructed to be guided by the street on which the house faced or was numbered. About the only places in which difficulty was experienced were in flat buildings with several meters and in downtown districts where each building had several meters. Two of the company's oldest employees were assigned this work, because they knew where to look for meters. After the canvass, linemen made a general tour of the system, tracing services to ascertain if meter records were properly established. They found four houses where electricity was being stolen.

Majority of Customers Respond Willingly to Appeal

The upshot of the whole affair was that the great majority of the customers were able to give the exact information necessary to re-establish accounts. All but a small percentage did this willingly. Against those who could or would not give information estimated March and April bills were rendered. When customers called to settle an adjustment was made based on their consumption between the time of the canvasser's first reading and the next reading made after the record was established. At the end of six months of this work records were pretty well established. The bulk of them were obtained in the first sixty days, but accounts came straggling in for the next four months. After that it was only occasionally that some one discovered a "lost" meter. So at the close of the year the company was able to charge off the accounts uncollectible, which amounted to approximately $5000, or 10 per cent of the amount due after the fire.

How the Company Handled Obstinate Patrons

Many odd and interesting incidents which show how human nature works in such cases came to light while collecting was in progress. Customers who had quarrels with their neighbors brought in information about unpaid merchandise accounts, enabling the company to establish some records. Then there were other persons

who proffered information regarding unrecorded use of service with the proviso that the company pay them liberally for the information. Such offers were flatly refused.

The merchandise accounts seemed to give more trouble than service accounts. One of these cases, involving a sign sold to the leading dry goods store, was of particular interest. The sale was made and the sign was installed about three weeks before the fire. The terms on this bill were to have been cash on installation. The consumer entirely failed to mention the sign transaction to our canvasser, and we would have lost the account had we not just happened to think of it about six months after the fire. The writer immediately remembered that, instead of paying cash as he agreed, the merchant only paid $50. We called on him and asked him about the sign. He immediately said it was paid for long ago, and when asked for his receipt or his copy of the contract he said that he did not have them. We knew that a store of this size kept a careful record of transactions and were positive that he had all the information we wanted. We therefore made out a bill which we knew was about $50 more than the sign amounted to and sent it to him without any comment. The second day after this the merchant was in our office early in the morning with his copy of the contract and his receipt for the $50 paid, making vigorous complaint on the amount we were charging him. As soon as we got the information we wanted in our hands the writer told him face to face what we had done and why we did it, and the look that he gave will long be remembered. His actual balance was $175, and we insisted on having a check for it, which he gave.

PURCHASE OF OFFICE EQUIPMENT ALSO HANDLED ON APPEAL-TO-HONESTY BASIS

But, despite such incidents as this, our experience proved conclusively that the people in general are honest. On presenting the situation frankly we found them willing to treat us in the way they would expect to be treated had they been the sufferers. This spirit was evidenced not only by our customers but by firms from whom we bought. Of course we had to re-equip our office from pencils to scrap paper. We knew what the situation was by 6.30 on the morning of the fire. By 9.30 we had rented a vacant room, had desks and chairs installed and were ready to start business. Our printed matter was all destroyed, and our first effort was to notify every printer in the city who had ever done any work for us at all to go through his files and get a copy for all forms that he had printed for us. These all came in before the day was over, and by night we practically had ordered every form that was necessary to carry on our business. We wired for adding machines, typewriters, an addressograph and other appliances which could not be purchased locally. By the close of the next day we had most of this equipment in the office. Most of it was loaned to us until such time as we could place a definite order for the exact kind wanted. We bought everything without discussing prices, leaving the matter to the honesty of the seller, just as we had put our accounts that were due us up to the honesty of the consumer. In checking over these bills a year later we found that the printers were very fair with us, and one house in particular actually gave us everything at a lower price than we have been able to buy it since.

THE METER DEPARTMENT IN UNIFORM AND CAP

It Is Found that by Improving the Appearance of Meter Readers a Better Impression Is Made Upon Customers

In a very considerable number of towns in the United States the men who read the electric meters certainly look like a lot of cut-throats or desperadoes. There is a feeling that since they must go into cellars and out-of-the-way places where dirt and dust prevail they cannot be expected to keep clean or present a very tidy appearance.

On the other hand, the effect that the unkempt appearance of such men has on consumers has probably never entered the mind of the employers of these men.

STANDARD OF DRESS AND NEATNESS OF APPEARANCE SPEAK WELL FOR THE COMPANY

It is not strange, however, that consumers should question their bills when the meter has been read by a man whose personal appearance is not prepossessing. Many customers undoubtedly distrust the meter readers on this account.

It has been with this conviction that some central stations have taken steps to improve the appearance of their meter readers. The Rockford (Ill.) Electric Company, one of the American Gas & Electric properties, has put the members of its meter department in uniform. As can be seen from the accompanying illustration, the men present a neat and dignified appearance well in keeping with the responsibility they have. They are the greatest source of personal contact that the company has with its customers, and in uniform they help to promote a friendly feeling on the part of customers toward the company.

The uniform is of dark tan-colored woolen cloth with a standard conductor's cap to match. The letters "R. E. Co." are sewed across the front of the cap and also on the edge of the upper pocket of the coat, forming a distinguishing feature.

Arrangements have been made with one of the local clothiers to supply the uniforms at a low cost. The men pay for them, but by a slight raise in pay when the plan was put in effect the company actually meets one-half the cost. The cap is the property of the company and has to be returned when a meter reader drops out.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

RUBBER INSULATION

Specification and Tests Proposed in Report of Joint Rubber Insulation Committee

RUBBER insulation is of vast practical importance to electrical engineers. In recent years there has been no difficulty in securing insulation having the dielectric strength, specific resistance, elasticity and mechanical strength required in practice. Indeed, with the possible exception of dielectric strength, these qualities are usually in excess of actual service requirements. However, there is another quality, namely, permanence, which, although equally essential, has not been so easy to obtain. It is an important problem to devise some tests which will indicate the permanence of rubber for insulation. The problem is evidently to establish some relation between permanence and one or more of the properties which are susceptible to tests.

Two types of specification have been devised—first, a purely physical specification, but specifications based exclusively on physical tests have fallen into disrepute, though such tests now serve in modified form as adjuncts to other types of specifications.

The second type of specification is that in which a more or less rigid formula for the compound is specified and compliance with it exacted either by inspection during manufacture or by chemical analysis supplemented by other tests of the finished product.

The Specification Adopted

The specification worked out by the Joint Rubber Insulation Committee is of the second type. This joint committee, which has been at work since 1911, consists of representatives of government departments, national societies, manufacturing electrical companies, operating electrical companies, etc. The report of this committee is printed in full in the April, 1917, issue of the *Proceedings* of the American Institute of Electrical Engineers. The committee's specification for a rubber insulating compound has been adopted by the principal engineering societies which issue standards of this kind. Among these are the American Electric Railway (Engineering) Association, the Association of Railway Electrical Engineers, and the American Society for Testing Materials. The specification has also been adopted by a large number of important purchasers of insulated wire, including the United States Signal Corps, the Panama Canal, the New York Central Railroad Company, the Interborough Rapid Transit Company, the Public Service Corporation of New Jersey, etc.

We herewith give the specification for 30 per cent Hevea rubber compound (chemical clauses) in full from the report:

> A 30 per cent fine Para or best quality plantation Hevea rubber compound with mineral fillers shall be furnished. It shall contain only the following ingredients: Rubber, sulphur, inorganic mineral matter, refined solid paraffine or ceresine.
>
> The vulcanized compound shall conform to the following requirements, when tested by the procedure of the Joint Rubber Insulation Committee, results being expressed as percentages by weight of the whole sample:

REQUIREMENTS INDEPENDENT OF THE AMOUNT OF RUBBER FOUND

	Maximum	Minimum
Rubber	33	30
Waxy hydrocarbons	4	..
Free sulphur	0.7	..

Red lead, carbon, or organic fillers shall not be present.

REQUIREMENTS DEPENDENT UPON AMOUNT OF RUBBER FOUND

(Requirements for intermediate percentages shall be in proportion to the percentage of rubber found.)

Limits Allowed for 30 Per Cent Rubber Compound:	Maximum	Minimum
Saponifiable acetone extract	1.35	0.55
Unsaponifiable resins	0.45	...
Chloroform extract	0.90	...
Alcoholic potash extract	0.55	...
Total sulphur	2.10	...
Specific gravity	...	1.15
Limits Allowed for 33 Per Cent Rubber Compound:		
Saponifiable acetone extract	1.50	0.60
Unsaponifiable resins	0.50	...
Chloroform extract	1.00	...
Alcoholic potash extract	0.60	...
Total sulphur	2.30	...
Specific gravity	...	1.67

> The acetone solution shall not fluoresce.
>
> The acetone extract (60 cu. cm.) shall be not darker than a light straw color.
>
> Hydrocarbons shall be solid, waxy and not darker than a light brown.
>
> Chloroform extract (60 cu. cm.) shall be not darker than a straw color.
>
> Failure to meet any requirement of this specification will be considered sufficient cause for rejection.
>
> Contamination of the compound, such as by the use of impregnated tapes, will not excuse the manufacturer from conforming to this specification.

In the full report of the committee this specification is followed by a greatly detailed outline of analytic procedure and by notes which explain certain parts of the specification. It is stated, for instance, that experience has shown that compounds of the grade which contains only good Hevea rubber may be relied upon to be more permanent than those made of rubber of other grades. It is not affirmed by the committee that a compound which conforms with this specification is necessarily permanent, or that a better compound cannot be made, but it is believed that enforcement of the specification will limit the use of inferior materials and that it will put the manufacturers more nearly upon an equality of endeavor, where they can use their experience to obtain the best results. Used in connection with the analytical procedure, the specification will enable purchasers to order a good compound and to ascertain with a greater certainty than heretofore whether the material received represents the compound specified.

It is also emphasized that this specification should be supplemented by appropriate elasticity and tensile strength tests, in order to add to the assurance that good rubber has been used and that the vulcanization process has been properly carried out; also, by appropri-

ate electric stress and resistance tests, to assure proper insulating qualities and homogeneity of structure. The exact value of the limits for these tests will depend upon the use to which the material is to be put.

Generators, Motors and Transformers

Voltage Regulation of Rotary Converters.—G. A. JUHLIN.—The conclusion of his paper read before the (British) Institution of Electrical Engineers. After having discussed the systems of the reactance control and booster control for regulation of rotary converters, the author discusses the relative advantages of the two systems in cases where two ranges of voltages are required, namely, 400 to 440 volts for lighting and power and 500 to 550 volts for traction. From the point of view of first cost, the advantage would be with the reactance control. The size of the booster would be materially reduced by arranging the transformers with tappings giving 420 and 525 volts respectively on the continuous-current side and providing a change-over switch, as in the case of the reactance control. The advantage of this arrangement would be not only reduced cost but also improved conditions from a point of view of commutation on account of the reduced boost. This advantage is more marked in large units than in smaller ones, owing to the increasing difficulties in commutation. As regards the power factor, the booster type of converter has the advantage, as its power factor can be varied at will under all conditions of load and voltage, and, in cases where wattless currents are required for power-factor improvement independent of the voltage conditions, it is the only type suitable. When no leading currents are desired, however, there appears little or no reason why the reactance type should not be used, and it is doubtful whether better results would be obtained with the booster type. With the reactance type of control it is only necessary to operate the field rheostat in changing the voltage, and the fact that the power factor is fixed definitely for each voltage is not altogether a disadvantage. With respect to the commutation the reactance control has the advantage. Satisfactory commutation is obtained with the booster type of machine, but much finer adjustments as regards interpoles and brush gear are necessary with this type of machine. As to the range of voltage the reactance type is somewhat limited and $\pm 7\frac{1}{2}$ per cent may be considered as the limit, while with the booster type a great range may be obtained, 15 per cent or even more. The efficiency is slightly higher for the reactance type. With respect to starting there is no difference between the reactance type and the booster type. Less space is required for the reactance type, while with respect to maintenance the booster type requires more parts to keep in order. An account of the discussion which followed is also given.—London *Electrician*, March 16, 1917.

Generation, Transmission and Distribution

Gas Power Versus Water Power.—H. G. H. TARR.—The author gives comparative figures to show that gas power may be cheaper than water power if the by-products gas producer is used, not in connection with gas engines but in connection with gas-fired steam boilers and steam turbines. Not all American coals are suitable, but there are enough available which can be used. The author first gives figures for the cost of a 20,000-hp. water-power plant, for which an investment of $5,333,000 is assumed, finding a total operating cost of $656,000 a year, with an income of $1,111,000 (from electric power, assuming an 85 per cent load factor), so that there is a profit of $455,000 or 8.5 per cent on the investment. He then gives the figures for a 20,000-hp. steam power plant with Mond by-products recovery. The total investment is $2,860,000, the operating cost $760,000. The income from the electrical power is as before $1,111,000, while from ammonium sulphate (70 lb. per ton—31.8 kg. per metric ton—of coal), at 3 cents per pound, the income is $312,900, so that there is a total income of $1,433,900, or a profit of $673,900 or 23 per cent on the investment. The American coals best suitable for the process have been found to be those from Kentucky, high in nitrogen while they burn freely and do not cake or coke in the producer. Aside from this any coal that has sufficient nitrogen content is suitable, and it is believed that present studies will develop a producer that will overcome this obstacle.—*Met. and Chem. Engineering*, April 1, 1917.

Installations, Systems and Appliances

Auto-Transformers.—An illustrated discussion of a case of improper use of auto-transformers for interconnecting different systems, which resulted in serious troubles being transferred from one system to the other. The conclusion is drawn that the neutral point of all auto-transformers should be earthed. It should be remembered, however, that earthing an existing insulated distribution system requires the substitution of three-pole for two-pole relays on automatic circuit breakers. The presence of several earths on a distributing system favors the development of harmonic currents, which may produce serious telephonic disturbances and even attain values high enough to cause material damage. It is not advisable in any case to connect two important systems of distribution by auto-transformers, since all disturbances, of whatever origin (atmospheric disturbances, earth faults, etc.), are then transferred freely from one system to the other. The magnetic circuit of a double-wound transformer forms an elastic link, eliminating all risks of such a nature.—London *Elec. Review*, Jan. 5, 1917.

Electrophysics and Magnetism

Mathematics of Oscillating-Current Circuits.—V. BUSH.—A paper read at the recent New York Meeting of the American Institute of Electrical Engineers in which the author shows how oscillating-current circuit problems can be treated by a new method involving a generalized angular velocity and a generalized impedance which are complex quantities. Kirchhoff's law may be thus generalized and yields a simple method of determining the generalized angular velocities, and thus the frequencies and decrements, of free oscillation. The method is illustrated by three examples.—*Proceedings* American Institute of Electrical Engineers, February, 1917.

Units, Measurements and Instruments

French National Laboratory.—P. JANET.—A review of the work done by the Central Laboratory of Electricity in Paris and its international scientific importance, with a chronological list of the papers which have emanated from that institution.—*Rev. Gen. d'Elec.*, Feb. 17, 1917.

Telegraphy, Telephony and Signals

Wireless Telegraphy Receivers for Use in Cable Telegraphy.—Louis W. Austin and Louis Cohen.—The receiving instruments in radio-telegraphy, particularly the audion and ticker types, are of a far higher order of sensitiveness than those used in cabling. The present authors think that they may be used to great advantage

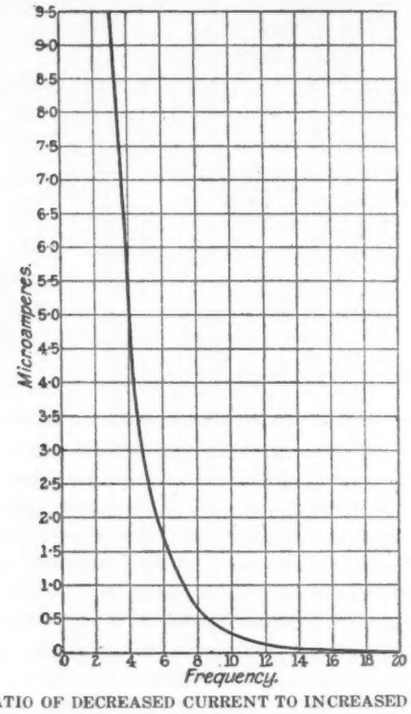


FIG. 1—RATIO OF DECREASED CURRENT TO INCREASED FREQUENCY

also in cable work both for audible reception and for recording. The audion operates as an oscillator for any frequency even below the range of audibility, and by associating with it an oscillating circuit of suitable electrical constants it can be made to oscillate with an audible frequency, the note of which is heard in telephones connected to it in the usual way. The received signal modifies the oscillatory current and the variation thus produced is heard in the telephones. Or the audion may be adjusted for the critical point just short of oscillations, and the effect of the received signal is to start momentary oscillations in the audion. In such an arrangement a current of 1 microampere is more than ample to give a readable signal, and even less than 1 microampere will suffice. In case of the ticker method the operation is somewhat different. The function of the ticker is merely to interrupt the incoming current, rendering it audible, and thus make it possible to use telephones for the reception of signals. For recording purposes the recording device is preferably connected through a transformer to the detecting instrument. Higher sensitiveness of the receiver is particularly desirable for the Squier system, in which the speed of signaling is directly proportional to the frequency of the current employed; but for the same transmitting voltage the current at the receiving end decreases very rapidly as the frequency is increased. In Fig. 1 a curve is given showing the decrease in received current for a transatlantic cable for increasing frequency. For a frequency of 20 the current at the receiving end is about 0.3 microampere for 100 volts at the transmitting end, and therefore it is only with highly sensitive detectors that any such frequency could be employed for cable work. The combination of the use of alternating currents and highly sensitive detectors offers the additional great advantage that the solution to the problem of multiplexing can be realized. In direct-current cabling all improvements in regard to increase in sensitiveness and speed are controlled by the accuracy with which the duplex bridge may be balanced. The opening and closing of the circuit in signaling introduces transient effects which are difficult to balance accurately. This was recognized by Squier. The use of an unbroken alternating current eliminates many of the difficulties in balancing which were considered heretofore as inherent in duplex cabling, and also simplifies the problem of multiplexing. In conjunction with G. O. Squier, the writers developed a method in which an extra simplex system is superimposed on a Squier duplex cable. The arrangement of circuits used is shown in Fig. 2. At the two ends of the cable there are stations *A* and *B* equipped for duplexing, and in addition there are stations *D* and *C*, where one acts solely as the transmitter and the other as the receiver, constituting the superimposed simplex system. In the simplex system, which may be designated by *DC*, audible reception is used. The frequency of the current may be either within the range of audition or below audition and rendered audible at the receiving end by a ticker or an audion, the frequency of the current being comparatively high, say, 15 or more. The current used in the duplex system is of low frequency. The two receiving circuits at *B* and *C* are tuned for the corresponding frequencies of the signals which are to be received at the respective stations, and since the frequencies used in the two cases are quite different, the tuning of the circuit will insure responsiveness of each receiver only to the current of the signal which is to be received at each station. To eliminate the effect of transmitter *B* in receiver *C*, the receiving circuit is coupled to the bridge arm of the artificial cable as well as to cable, and the secondaries so connected as to induce equal and opposite emf.'s in the receiving circuits, thus neutralizing the effect of transmitter *B* on receiver *C*. A little different arrangement is employed to eliminate effect of transmitter *D* on receiver of station *A*. In addition to double transformers, which neutralize each other's effects, a loop circuit tuned to the frequency of transmitter *D* is also introduced in receiving circuit of station *A*, thus rendering it opaque to currents of frequency produced by

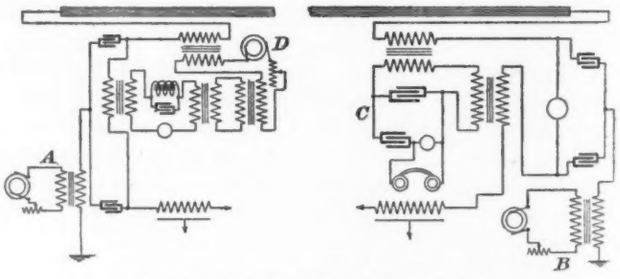


FIG. 2—ARRANGEMENT OF CIRCUITS

station *A*. In this way it becomes perfectly feasible to superimpose an extra simplex circuit on a duplex cable. By suitable modifications of transformers and tuned circuits, and also making use of different frequencies, it is possible to develop a system in which a number of simplex systems are superimposed on a duplex cable.—London *Electrician*, March 16, 1917.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

JOBBERS AND THE N. E. L. A. COMMITTEE MEET TO CO-OPERATE

Representatives of the Two Associations Consider Basis of Practicable Co-operation and Will Have Further Negotiations

A meeting of a committee representing the Electrical Supply Jobbers' Association and the Commercial Section of the National Electric Light Association was held at the N. E. L. A. headquarters in New York on April 6. The purpose of the meeting was to discuss co-operation between the two bodies in accordance with the general idea expressed at the meeting of the N. E. L. A. executive committee on March 9.

The following were present at the meeting on April 6: Chairman E. A. Edkins, M. S. Seelman, R. R. Young and J. F. Becker, representing the N. E. L. A., and W. E. Robertson, F. S. Price, N. G. Harvey, W. A. Pixley, T. M. Debevoise and Franklin Overbagh, representing the jobbers.

After extended discussion lasting through luncheon and into an afternoon session, the jobbers suggested that with the general discussion as a basis they would prepare, probably through Mr. Overbagh, in letter form a basic outline of co-operation which could be practiced to the mutual interest of all concerned. This brief will be given consideration by Chairman Edkins' committee, after which further action will be determined.

FIXED PRICES DENIED BY SUPREME COURT DECISION

Limited-License Plan of Distribution Followed by Victor Talking Machine Company Held Illegal by Highest Tribunal

Decisions rendered by the United States Supreme Court on April 9 declared that price-fixing restrictions for public use of patented articles of the Victor Talking Machine Company and others were illegal and void. The ruling in the Victor case, written by Justice Clarke, was adopted by a vote of six to three, Justices McKenna, Holmes and Van Devanter dissenting. R. H. Macy & Company, New York, were in the case. The higher court reversed the decision of the lower court in the suit brought to prevent that company from selling machines at "cut prices." Machines were sold by the manufacturer under a license agreement to avoid an outright sale by the Victor company. The bill was dismissed by the court for the Southern District of New York and that decision was reversed by the Circuit Court of Appeals on the ground that the patentee may dispose temporarily of the use and ultimately of the title of a machine made by him under a patent right.

A second decision upon patent rights, following the same lines, was in the case of the Motion Picture Patents Company against the Universal Film Manufacturing Company.

TUNGSTEN LAMP PATENT DECISION UPHELD IN ENGLAND

Higher Court Denies Patents for Treatment of Tungsten for Lamp Filaments and Improved Wire-Drawing Methods

Information has been received that the court of appeal in England has rendered a decision in the appeal of the British Thomson-Houston Company against the decision of Justice Astbury in the case of British Thomson-Houston Company, Ltd., vs. Duram, Ltd.

In the first action the plaintiffs asked for an injunction against the defendants for infringements of two patents. The first of these, dated 1906, was for an invention of a process and apparatus for the treatment of metallic tungsten for the manufacture of electric lamp filaments therefrom. The second, dated 1911, was for an improved method of drawing wire by the use of graphite as a lubricant. Justice Astbury held that the first patent was bad for want of subject matter and that the second was bad, as a complete user of the invention for the purpose of commercially drawing wire had been proved to have existed in 1905.

The court of appeal upheld the rulings of Justice Astbury and dismissed the appeal. Details of the suit in the lower court were published in the ELECTRICAL WORLD of Jan. 13, 1917, page 71.

SUCCESS OF N. E. L. A. PLAN FOR CONVENTION EXHIBITS

Assignments Made, All Space Taken and More Wanted—Exhibitors Urged to Have Educational Features

The assignment committee of the National Electric Light Association, meeting at the offices in New York on April 5, made assignments for the exhibits for the Atlantic City convention, which is to begin on May 29.

The exhibition committee arranged for more than double the amount of space that has been used by the association in the past. For the first time in the history of the association all the space was applied for previous to the assignment. Present conditions make this a remarkable showing. Additional applications are coming in almost daily, and it will be necessary for the exhibition committee to plan additional space, if possible, to care for the Class "D" members that have not formally applied but wish to make an exhibit.

The executive committee of the National Electric Light Association is particularly repeating its request that each exhibitor have one or more features of a working or educational nature.

Exhibitors shipping by freight should take up the matter with their transportation departments and arrange to have the shipments reach Atlantic City by May 20 at the latest. Arrangements are being made by the exhibition committee to care for such shipments.

Electrical Industry in War Time

While Central Stations Consider Ways and Means of Serving, Great Industries Turn to Manufacturers for Flood-Lighting Accessories

OUTSIDE of the patriotic spirit in which international developments are awaited the great feature of the present situation in the electrical industry is the intensely practical nature of the activities which are engaging men and industries. Individuals and plants are giving necessary services.

In the larger councils at Washington, in the questions of policy and production as well as of protection, the electrical industry, by reason of its great power and resources, is taking a leading part. There is a general sentiment that "business as usual" will be the dominating note in future operations.

As an indication of the attitude of the central station industry Herbert A. Wagner, president of the National Electric Light Association, has offered his services to effect the most efficient use of the members of that organization. The letter addressed by Mr. Wagner to the Secretary of War on April 4 says:

MR. WAGNER'S OFFER

"My attention has been called to letters written to you under dates of Feb. 28 and March 7, by Dr. Dugald C. Jackson of the Massachusetts Institute of Technology in reference to the organization of the engineers in the electrical industry for special service to the government. In these suggestions I heartily concur with Dr. Jackson.

"Electricity and electric power will play a very important part in the preparations for and conduct of the war in which we are about to enter. It is safe to say that the most highly trained and best disciplined electrical engineers in the country are those in the employ of electric central stations and electric manufacturers in the cities throughout the states. In many of these cities, as in my own city of Baltimore, the central station electric companies are furnishing large amounts of power for the operation of industries, including munition plants, upon which the government will be largely dependent for supplies, and to steam railroad companies for an important part of their transportation requirements.

"It is necessary that these power sources be conserved and operated for the benefit of the government, and that locally the government should have recourse to the services of the trained engineers in the employ of the power companies. The large electric central stations and the electrical manufacturers throughout the country are already organized, in a sense, for the interchange and dissemination of engineering information and for general educational purposes, through the National Electric Light Association, which has an enrollment of some 15,000 members in the electrical industry.

"This association is organized for effective work, through a large number of committees, including in the neighborhood of 1000 active men. Should the government find it advisable to take steps toward the organization of the men in these industries, to bring about their most efficient use for preparedness and defense, as president of the National Electric Light Association, and individually as an engineer of experience, I should be most glad to offer my services to the War Department in any way that you may see fit to utilize them.

"Many of the electric central station companies have already made special provision for such of their employees as may volunteer or be called for military service. It is highly probable, however, that a large number of the employees of these companies can be used to better advantage, in view of their special training, for local work in connection with the supply of power, and in engineering and organizing work in promoting efficiency in the production of supplies and munitions, and in perfecting local defense.

"It is to suggest your consideration of this phase of the situation both as Secretary of War and as chairman of the Council of National Defense, before numbers of specially trained men enlist for ordinary service, that I am encroaching on your time in these more than busy hours."

General attention is being directed to the value of flood-lighting as a means of protection for industrial

EFFECT ON THE INDUSTRY

As Expressed by Central Station Executives

FROM W. W. FREEMAN, PRESIDENT UNION GAS & ELECTRIC COMPANY, CINCINNATI

To the ELECTRICAL WORLD:

It seems too soon to note any decided effect of the war situation on the industry. Naturally, the probability of largely increased taxation will tend to promote caution as to expenditures by business people, and this may affect the gross revenues of utility properties. Such increased taxation may also add to our expenses and make economies very necessary wherever practicable in our operations. If the demand for metals should be still further increased and the prices rise correspondingly, it will be increasingly difficult to finance extensions at the almost prohibitive cost of same. These are conditions which are quite likely to arise, but thus far conditions have not materially changed.

W. W. FREEMAN.

Cincinnati, Ohio, April 9, 1917.

FROM DUDLEY FARRAND, ASSISTANT TO PRESIDENT PUBLIC SERVICE CORPORATION OF NEW JERSEY

To the ELECTRICAL WORLD:

Central stations can be most useful in the service of their country if they continue in operation with undiminished energy. Their output is essential to public safety and comfort. The loyalty of both officials and employees is beyond question, but the military needs of the country require that the first service of these men shall be given to the protection and uninterrupted operation of the great generating plants upon which such momentous results depend. The experience brought out in the present war has so thoroughly demonstrated the soundness of this position that it is not open to debate.

DUDLEY FARRAND.

Newark, N. J., April 11, 1917.

A LARGE ROOF SIGN ON THE SUPERIOR (WIS.) WATER, LIGHT & POWER COMPANY PLANT MAKES A FINE APPEARANCE

FLOOD LIGHTING IS OF DEMONSTRATED VALUE IN MINING OPERATIONS

plants of every character. As a result of a keener realization of the importance of this resource the manufacturers of flood lamps are receiving heavy orders. The use of such lighting reduces the number of men required to patrol or watch an area and is an excellent safeguard against prowlers. In the application of such lighting much skill is being employed.

Such systems of lighting have been in use on a large scale in many sections of the country, and their flexibility and the speed with which they can be set up are leading to a vast extension of their application in the serious problem of assuring protection for industrial property.

In cases where patrols are used, one of the principal methods of protective lighting is to mount the projectors about 300 ft. apart, all pointing in the same direction and making a ring of light around the plant. In other places, where an open space is to be lighted, a bank of flood-lighting units is placed on a building with successful results.

ELECTRIC FLAGS

Electric flags and electric illumination for flags are being used in all parts of the country to a greater extent than ever before. Many ideas of this nature are being advanced. For instance, Senator James A. Emerson of Warrensburg, N. Y., has amended the act relating to the public buildings of New York State so as to cause the flag to be displayed at all times on the Capitol building and to be electrically illuminated between sundown and sunrise. Senator Emerson's amendment has been passed by the Senate and the Assembly and is assured of the Governor's signature.

In other communities public utility companies are taking an active part in patriotic displays of the flag and in picturesque lighting effects which throw that emblem of the nation into prominence at night.

TELEPHONE ENGINEERS READY

The American Telephone & Telegraph Company has offered about 500 engineers to work with the Signal Corps of the army and navy.

Of restrictive measures some touch allied industries in a slight way. In Greater New York the police authorities dismantled in one day 800 private wireless stations. This precaution has been taken in many other districts in accordance with the order of the President directing the Secretary of the Navy to take necessary action in the matter. This order provides "that such radio stations within the jurisdiction of the United States as are required for naval communications shall be taken over by the government of the United States and used and controlled by it, to the exclusion of any other control or use, and, furthermore, that all radio stations not necessary to the government of the United States for naval communications may be closed for radio communication."

IN STORAGE YARDS POWERFUL FLOOD LIGHTING IS A WISE PROTECTIVE MEASURE

ADEQUATE LIGHTING GREATLY SIMPLIFIES THE PROTECTION OF INDUSTRIAL PROPERTY

MANY POWER PROBLEM TOPICS AT BOSTON MEETING

Relative Merits of Isolated Plant and Central Station Service, Mechanical Stokers and Steam Turbine Developments Included

An assault by advocates of isolated plant service upon the central station was a striking feature of the power plant symposium at Boston, Mass., on April 4 and 5, under the joint auspices of the Boston sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. The meetings were tempered, however, by the recognition by some that ex cathedra declarations of economic superiority on the part of either device for supplying energy (sometimes plus heat) to modern business and industry should give way to investigation of each particular problem.

At the opening session on the evening of April 4, Frederick Ewing, mechanical engineer of the Mexican Petroleum Company, New York, emphasized the great importance of fuel oil, even to Eastern plants, in these times of high coal cost.

Value of Mechanical Stokers

R. Sanford Riley, president of the Sanford Riley Stoker Company, Worcester, Mass., described the evolution of the mechanical stoker and exhibited lantern slides of interesting installations, calling particular attention to the manner in which power-driven stokers have kept pace with increasing boiler and furnace sizes, providing at the same time for remarkably close control of fires through draft adjustment, automatic and otherwise, and variation of stoker speed. The value of mechanical stokers in stand-by stations associated with hydroelectric power plants was pointed out, full operating conditions being attained often in fifteen or twenty minutes from a "dead start."

High Temperature Insulation of Boiler Settings

The latest practice in high temperature insulation of boiler settings was described by P. A. Boeck, chemical engineer, Celite Products Company, New York. The author reviewed tests showing the reduction in heat transmission by the use of insulating brick and other refractory material incorporated into settings. Tests by the Bureau of Mines show that air spaces between brick walls are of little value in preventing the flow of heat through the walls. Insulation increases the thermal capacity of the boiler, minimizes local overheating and improves the general condition of the boiler room. The conductivity of the average firebrick between 400 deg. and 2500 deg. Fahr. varies from about 0.5 to 1.2 B.t.u. per square foot per 1 in. per hour for 1 deg. Fahr., giving an insulating ratio of more than ten to one in favor of the insulating material. Hollow wall spaces filled with powdered insulation are giving way to the use of insulating brick, which is sometimes also used over the drums. Numerous installations of "Celite" were shown in lantern slides.

The author said that an application of 2.5-in. insulating bricks in a plant at San Francisco, Cal., paid for itself in three months.

Factors Affecting Isolated Plants

Walter N. Polakov, consulting engineer, New York, reviewed the factors to be considered in deciding whether to purchase or to generate energy in a local plant. The author said that the high cost of isolated plant service is due often to obsolete methods or equipment. He intimated that through efficiency engineering the isolated plant can institute improvements which often obviate the need of purchasing energy.

Mr. Polakov attacked the central station interests of this country, contending that their rates are unduly high and criticising the policy of centralization in the generation and distribution of electricity.

A. R. Meek, Eastern manager of the Ridgway Dynamo & Engine Company, Boston, pointed out that central station and isolated plant service each have their sphere, to be determined by careful analysis.

The author challenged the alleged general economic benefits of centralization, and reviewed the heating and power requirements of a representative ten-story office building of 45,000 sq. ft. ground area. With coal at $7 per ton, Mr. Meek concluded after a protracted analysis that isolated plant operation would cost $4,745 less than central station service per year, the latter supplying electricity at 1.7 cents per kilowatt-hour. The estimated cost of the isolated plant was $44,800 or $112 per kilowatt, and the gross cost of isolated plant electricity per kilowatt-hour was 3.27 cents, the day and night consumption being respectively 74,400 kw.-hr. and 16,800 kw.-hr. per month.

Operation of Holyoke Municipal Plant

The last two papers of the session discussed the results of operation at the Holyoke (Mass.) municipal lighting plant and outlined possible co-operation between central station and isolated plant.

John J. Kirkpatrick claimed that the Holyoke plant is meeting its full requirements on a maximum rate of 6 cents per kilowatt-hour for domestic lighting. He said that barely 20 per cent of the Holyoke output is generated by water-power.

A paper, presented by an associate of P. R. Moses of New York in the absence of the latter, discussed the possibility of co-operation in the handling of diversified and peak loads.

At a get-together dinner before the final session, C. F. Weed, vice-president of the Massachusetts committee on public safety, talked upon preparedness.

Economy in Production

John A. Stevens, consulting engineer, Lowell, Mass., gave an informal talk upon power generation at the evening meeting on April 5 urging the struggle for greater economy in production. R. A. Langworthy of Stone & Webster, Boston, discussed the relation of the heating problem to economical plant operation.

Developments in Steam Turbines

At the final session, Dr. L. C. Loewenstein, General Electric Company, Lynn, Mass., talked informally, in the absence of Richard H. Rice, on recent steam turbine developments. He pointed out that the advance in turbine design warrants scrapping the machines of five years ago.

To-day a 45,000-kw. unit is being built which is of the horizontal type, running at 1200 r.p.m., and on 200 lb. steam pressure, with 200 deg. superheat and a 29-in. vacuum, producing a kilowatt-hour on a guarantee of 10.4 lb. of steam. A single generator is all that is required in the later designs of high-powered units. Improvements in condensers and boilers have been caused

by the advance in turbine design, and whereas vacua of 26 in. to 27 in. were formerly regarded as satisfactory under the reciprocating engine régime, the industry today is getting 29 in. and even 29.5 in. with a 30-in. barometer.

The last speaker was C. H. Bromley, associate editor of *Power*, New York, who reviewed recent progress in condenser practice.

VARIED ACTIVITIES OF THE ASSOCIATED MANUFACTURERS

General Offices to Be Removed to Grand Central Terminal District—Meetings of Sections and Board of Governors

The headquarters of the Associated Manufacturers of Electrical Supplies will be moved from 62 Cedar Street, New York, to the Forty-second Street Building, 30 East Forty-second Street. This change has been urged for some time to meet the convenience of members. It will provide more space for the general offices, the governors and for meetings. Charles E. Dustin, the general secretary, says that it is expected to move on April 28.

MEETINGS CALLED

A meeting of the outlet box section will be held on Tuesday, April 24, at 10.30 a. m. at the present offices, 62 Cedar Street, New York.

A meeting of the board of governors will be held on April 18 at 2.30 p. m. at the offices, 62 Cedar Street.

The wire and cable section will meet on Tuesday, April 17, at the Yale Club, New York City.

A meeting of the magnet wire committee of the wire and cable section will be held on Wednesday, April 18, at 10.30 a. m. at the offices, 62 Cedar Street.

WORK OF THE JOVIAN COMMISSION AT CLEVELAND

Large Meeting with Representatives of Local Electrical Leagues Results in a Definite Plan for the Future

A meeting called by Jupiter Henry L. Doherty of the special commission authorized at the last Jovian annual convention was held in the rooms of the Cleveland Electrical League, Cleveland, on April 3 and 4.

The following conclusions were reached, and they will be placed before an early meeting of the entire Jovian Congress and Past Jupiters, followed, if practicable, by a special meeting of the Jovian Order to enact necessary legislation:

First—The chief function of the Jovian Order shall be as an international association of Jovian leagues.

Second—The order shall retain its present status as an international semi-fraternal constructive development body with a large membership representative of the entire electrical industry.

Third—Appointment by Congress of an executive committee, each committeeman having charge of a department to which some specific activity is assigned, for example, insurance, membership employment, publication, educational and development. The reigning Jupiter would be chairman and the Mercury secretary.

Fourth—Jovian membership should be through membership in local league, with provision for individuals not wishing to join leagues and for others not wishing to become Jovians.

Fifth—In the future, as soon as is practicable, candidates will be accepted to membership in the order only through local leagues. All men who join a local league automatically become Jovians.

Sixth—Congressmen and statesmen to be elected by Jovians in their respective districts instead of by membership at large.

Seventh—Present method of voting to be changed whereby a quorum consists of members present either in person or by proxy following a call for a special or annual meeting, provided that no one delegate is permitted to vote more than nine proxies.

Eighth—Certain changes in constitution of the Past-Jupiters' Association to be decided by it.

BOUNDARIES FOR ILLUMINATING ENGINEERING SOCIETY SECTIONS

Geographical Limits for the Various Sections Fixed by a Special Committee and Adopted by the Council

A special committee on section boundaries has reported a plan for geographical boundaries of the various sections of the Illuminating Engineering Society. The committee considered it advisable to establish boundaries along state lines except in Pennsylvania and New Jersey, where division within the states seemed necessary.

The report of the special committee has been adopted

BOUNDARIES OF ILLUMINATING ENGINEERING SOCIETY SECTIONS

by the council of the society. It divides the territory as follows:

New England Section.—Maine, New Hampshire, Vermont, Massachusetts and Rhode Island.

New York Section.—New York, Connecticut, and that part of New Jersey north of 40 deg. 20 min. north latitude (*i.e.*, a little north of Trenton).

Philadelphia Section.—That part of New Jersey south of 40 deg. 20 min. north latitude, that part of Pennsylvania east of 78 deg. west of Greenwich (*i.e.*, just east of Altoona), all of Delaware, Maryland and District of Columbia.

Pittsburgh Section.—That part of Pennsylvania west of 78 deg. west of Greenwich, all of West Virginia and Ohio.

Chicago Section —Illinois, Indiana, Wisconsin and Michigan.

PACIFIC COAST SECTION: IDEALS AND NEEDED WORK

President R. H. Ballard Tells Through the Electrical World of the Urgent Necessity of a Close-Knit Organization

A statement of the purposeful ideals and successful work of the Pacific Coast Section of the National Electric Light Association has been prepared for the ELECTRICAL WORLD by R. H. Ballard, Los Angeles, Cal., the president of the section. It is as follows:

"Meeting an insistent demand for an organization on the Pacific Coast which, while embracing the ideals and underlying principles of the National Electric Light Association, will provide means for the proper application of these principles to our special conditions, the Pacific Coast Section was organized on Jan. 6, 1917. The enthusiastic welcome accorded to it since then in all fields of its activities is the best evidence of its need.

MEMBERSHIP OF 1500

"In the three months of existence a very active campaign by its membership committee has resulted in cementing together into one organization practically all of the light and power companies in the vast area included in its geographic boundaries in California, Arizona, Nevada and New Mexico. The total membership at this writing exceeds 1250, and it is confidently expected that at the first convention of the section, to be held at Riverside, Cal., on April 19, 20 and 21, 1917, a total of 1500 members from all classes will be reported.

"In true Western spirit, manufacturers, jobbers and contractors have been invited to affiliate with the section, take an active part in its work and be represented on committees, including representation on the executive committee. The response from these interests and the spirit of co-operation shown have been most gratifying.

"Instead of dividing the association into separate sections, the general plan of segregation by committees has been adopted and the responsibility for all matters connected with the several divisions of activity rests with these committees, authority being given for the formation of as many sub-committees as may be necessary and the preparation of papers by individuals, but always subject to the control of the committee itself. These committees are: public policy, engineering, commercial, accounting, membership.

"At the forthcoming convention committee chairmen will preside while their reports and papers are under discussion. All reports and papers, excepting the report of the public policy committee, will be printed in advance and copies distributed to each member of the section some days before the convention. Brief abstracts of the papers and reports and discussion thereon will constitute the procedure at the convention. The report of the public policy committee will be presented at a banquet on the evening of the second day, which will be tendered to members, ladies and invited guests.

EDUCATION AND CO-OPERATION

"Education and co-operation may be said to be the broad plan of the Pacific Coast Section—education not only of the men connected with the industry as employees but of the officers of the companies as well. Adopting a common ground, the aims, policies and duties of the industry may be placed concretely before the public in such a way as to encourage a broader and more comprehensive knowledge of the value of the industry to the public and the public to the industry, thus promoting co-operation. not only in methods of construction, commercializing, standardizing and efficiency, but in public relations, regulation and employees' welfare work.

LIGHTING DEMONSTRATION ON ELEVATED BLOCK IN NEW YORK

Experiment by New York Edison Company and Sixth Avenue Association in the Successful Distribution of Light

A lighting demonstration of the Sixth Avenue Association on a "model block," between Forty-eighth and Forty-ninth Streets, on both sides of the avenue, has attracted much comment in New York.

When the organization committee called a meeting Arthur Williams of the New York Edison Company presented the scheme of picking out a "model block" and lighting it as it should be lighted, as a demonstration of what could be done.

After the block had been selected the bureau of illuminating engineering of the company designed lighting schemes for all show windows and installed the wiring, fixtures and lamps with signs and 500-watt lighting units outside to assist in lighting the street beyond the curb line. The block has seventeen stores and the show window of each store is lighted differently, particular attention being paid to the color. Some stores are lighted by daylight lamps, some by amber lamps, some by red-tinted lamps and others by a combination of different colors.

BEFORE—DISMAL STREET AND UNATTRACTIVE WINDOWS

AFTER—THE BRIGHT ILLUMINATION INVITES INSPECTION

STREET-LIGHTING EXTENSION CONTRACTS LET IN CHICAGO

Details of Awards for Bulk of the Improvements Authorized by Voters at the Recent Election in That City

The bulk of the work to be done in improving and extending Chicago's street-lighting system, in accordance with the vote at a bond election at which the necessary funds were authorized, has been let to contracting firms in the city.

This procedure, it has been determined after calling for bids on labor and material several times and after installing trial circuits under the direct jurisdiction of the city, is the least expensive plan of handling the improvement.

The contract for installing the posts and the cable, amounting to about $1,500,000, was awarded to W. F. Cummings of Chicago. A large number of posts have already been purchased by the city, but during 1917 it is expected that this contractor will buy 2,140,000 ft. (652.27 km.) of No. 8 600-volt armored cable, 275,000 ft. (83.82 km.) of 5000-volt No. 8 armored cable and 6000 cast-iron posts.

The Contracting & Material Company, Chicago, secured the contract for furnishing and laying the conduit. This contract amounts to about $150,000.

The contract for substations, amounting to $38,000, was awarded to the Pierce Electric Company of Chicago.

WAR CONDITIONS AFFECT MARCONI WIRELESS OPERATIONS

Organization and Personnel, Including High Power and Coastal Stations and Manufactories, Are Offered to Our Government

Information in regard to the effect of war conditions is given in the report of directors of the Marconi Wireless Telegraph Company of America for the year 1916. These conditions, preventing the operation of the transatlantic stations at New Brunswick and Belmar, N. J., and Marion and Chatham, Mass., remain unchanged.

"The British Admiralty still holds, for military purposes, the English plants constructed for exchange of traffic with this country," says the report. "The continuance of the war has likewise rendered it impossible to inaugurate our direct service with Scandinavia.

"Service with Japan was successfully inaugurated on Nov. 15 last, and an increasing volume of traffic is being handled, under government censorship, at a tariff one-third lower than that of the submarine cable. On the Pacific, as on the Atlantic, operations are restricted by war conditions, the Japanese stations being controlled by that government. For the present, therefore, the new service is limited to traffic between San Francisco, Hawaii and Japan.

"Your company continues to manufacture apparatus for use by the United States army and navy, and recently has been awarded contracts for a large number of wireless sets of various types."

When diplomatic relations with Germany were severed the organization and personnel, including the high-power and coastal stations wherever situated, the manufactories, workshops and trained staff, were offered to the government. This offer was acknowledged by the President and the Secretaries of War and the Navy. The officials of the company are co-operating closely with the government.

Gross earnings from operations of the company in 1916 were $862,502, as compared with $748,238 in 1915. Receipts from message traffic with ships show an increase of 9 per cent over 1915.

HIGHER ELECTRIC RATES TO OFFSET HIGHER COSTS

Penn Central Light & Power Company Asks Pennsylvania Commission to Help by Allowing 12 Per Cent Advance

An increase of about 12 per cent in rates is asked by the Penn Central Light & Power Company, Altoona, Pa., in a schedule filed with the Pennsylvania Public Service Commission.

J. H. Shearer, general superintendent of the company, says in a public statement that the operating expenses have increased 61.4 per cent, while earnings have increased but 27.8 per cent. Expenses in February were 93.1 per cent higher than in February, 1916. Taxes were 10 per cent higher.

About 70,000 tons of coal are used in the year. In 1914 coal cost $1.90 per ton, while for the first three months of 1917 the price was $5.39, an increase of 183 per cent. Copper has trebled and all other materials used in the service have also advanced. Mr. Shearer says that the higher rates will be far from sufficient to cover the difference caused by higher expenses.

The increase for each individual, Mr. Shearer points out, will be insignificant.

MANUFACTURERS OF ELECTRIC VEHICLES TO HOLD CONFERENCE

Meeting Called for April 19 Is to Supplement the February Gathering of Central Station Representatives

A conference of electric vehicle manufacturers is to be held on Thursday, April 19, at 1.30 p. m., at the headquarters of the National Electric Light Association, New York.

Chairman E. S. Mansfield of the Electric Vehicle Section of the association says that definite plans are being formulated to promote wider use of electric vehicles in co-operation with the central station industry. The importance of the meeting is being urged upon manufacturers of electric passenger and commercial vehicles, electric industrial trucks, batteries, tires and accessories. Following is the tentative program:

"Analysis of the Present Electric Vehicle Situation and the Purposes of This Conference," by Chairman E. S. Mansfield; a paper by C. D. Fairgreave, Anderson Electric Car Company, on "Advertising and Publicity"; a paper on getting local distribution, by P. D. Wagoner, General Vehicle Company; "The Charging Problem in Vehicle Selling," by C. A. Street, Walker Vehicle Company; "The Electric Industrial Truck," author not yet determined; paper by E. P. Chalfant, Anderson Electric Car Company, on "Co-operation."

After discussion on these addresses a plan for action will be proposed.

This conference of manufacturers follows a similar conference of central station representatives on Feb. 14.

POWER FOR PHILADELPHIA IN DAYLIGHT DARKNESS

Electricity the Accepted Defense Against Heavy Fog Bank Which Oppressed the City for Several Hours at Midday

Philadelphia had an experience with midday darkness one day in March. The unusual darkness became acute about 10.30 in the morning and continued until nearly 3 p. m. It was caused by a fog bank which, according to the director of the Philadelphia weather

ELECTRICITY IS THE ACCEPTED DEFENCE AGAINST DARKNESS

bureau, covered approximately 25 square miles and weighed 550,000 tons.

The demand upon the Philadelphia Electric Company for energy above the normal amount used in the central district in the daytime was approximately 8000 hp.

An interesting letter describing the organization through which the Philadelphia Electric Company prepares for a demand of this character appeared in the Philadelphia *Public Ledger*. It was written by Charles Meigs Ripley of the Philadelphia office of the General Electric Company.

Mr. Ripley showed that in this case the cloud "stormed" Philadelphia unannounced, coming "in the only manner possible to escape detection, *i.e.*, straight down from above." He added:

"There is within the walls of the modern power plant a field for romantic and fascinating stories more interesting than most of the tales of Homer or Dumas. The electrical industry needs a Kipling or a Jack London adequately to describe the electrical developments of the twentieth century.

"Marvelous as was the achievement, it should be understood that a total reserve capacity of 42,000 hp. was available and ready to meet an even greater emergency. It is true alike of electrical generating machinery and armies that 'they also serve who only stand and wait.'"

PLANS OF THE SOCIETY FOR ELECTRICAL DEVELOPMENT

Annual Meeting Is to Be Held on May 8 and Comprehensive Sales Plans Are to Be Presented for Consideration

The annual meeting of the Society for Electrical Development, Inc., will be held on May 8, at its offices in the United Engineering Societies Building, New York City.

Directors for the ensuing year will be elected, and the report of J. M. Wakeman, the general manager, will be presented. Plans for 1917 and early 1918 will be discussed.

The society has comprehensive sales plans to present for the periods following "America's Electrical Week" and "Wire-Your-Home Time."

After the annual meeting the directors will elect officers. The directors are expected to decide whether there should be another electrical week this year or next spring, and to appoint a committee to take charge of such a campaign.

COAL SUPPLY A COSTLY BURDEN IN NEW JERSEY

President Thomas N. McCarter Discusses the Expense, Which, Under Rigorous Regulation, Cannot Be Passed to Consumers

"The great difficulty of operating this company for the year has centered around the coal supply," said President Thomas N. McCarter in the annual report of the Public Service Corporation of New Jersey in referring to the subsidiary Public Service Electric Company.

"The coal for the year," Mr. McCarter adds, "was contracted for with responsible contractors, who, however, owing to conditions which for the most part they could not control, were able to make deliveries of only a small portion of the amounts called for by their contracts. It, therefore, became necessary to buy coal in the open market at going prices. Enormous quantities of coal were purchased by the company at prices running from $6 to $7 per ton, as against its contract price of $3.25 per ton.

"It can be readily imagined how vital this matter is. Unlike the ordinary manufacturer, this emergency cost cannot be passed on to the consumer by the company. This situation affords a melancholy illustration of the results from and dangers of rigorous rate regulation."

The increase in kilowatt-hours commercially sold by the company was 83,792,262, or 42.52 per cent. The revenue from electric sales increased 23.02 per cent. The revenue from electric sales averaged 4.45 cents per kilowatt-hour sold, as against 5.16 cents per kilowatt-hour in the previous year. The ratio of operating revenue deductions to operating revenue was 58.4 per cent, as against 54.3 per cent for the corresponding period in 1915.

Mr. McCarter shows that taxes for the year amounted to $2,713,059, an increase of $396,093 over the previous year.

"The corporation will always be ready to bear its share of the public burden," Mr. McCarter continues, "but there is a limit to the increase in taxation it can bear, unless the burden is to be passed on to the consumer by a raise in rates.

"There is pending in the Legislature a bill, which has received the support of the dominant political party, which seeks to raise the franchise taxes paid by the gas and electric companies from 2 per cent of their gross receipts to 5 per cent in increasing installments of 1 per cent a year, reaching the maximum after three years. If enacted into law this statute would, when fully consummated, increase the taxes of these two companies annually by about $900,000 or $1,000,000 a year.

"Thus the sovereign power of the State is constantly being exercised to increase the operating expenses of these companies through taxes with one hand, and to reduce their revenue by rate reductions with the other. How long can this continue, especially in times of economic inflation like the present when all operating costs are abnormally swollen?"

A "graphic illustration of the advantages of government by commission," cited by Mr. McCarter, is the expense of collecting data and preparing the electric rate case for submission to the commission. Exclusive of the salaries of its own employees who are concerned with this case the company has already expended in and about this matter $362,752. The estimated total cost, after completion of the investigation, is $500,000.

HYDROELECTRIC POWER HELPS NORTHERN STATES COMPANY

Increased Cost of Fuel, Bought Necessarily in Part at Retail Prices, Contrasted with Water Power Generated and Purchased

At the date on which the annual report of the Northern States Power Company was prepared (March 19, 1917) the sales of stock to residents of the territory served amounted to approximately $1,436,300 par value, distributed among 2774 holders.

The business of the company increased rapidly in 1916, gross earnings amounting to $6,087,153 as compared with $5,121,827 in 1915. Large extensions and additions have been made and are being made.

President H. M. Byllesby refers to the circumstance that the company will secure an increasing proportion of power from hydroelectric plants, as follows:

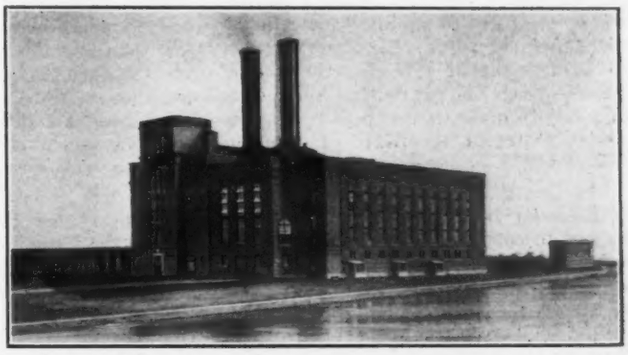
"During the past eighteen months your company, in common with all others, has been confronted with a necessary increase in labor cost and a marked increase in the cost of all materials entering into its operation and construction. Also, notably during the past four months, it has suffered greatly from increased cost of fuel required for that part of the power generated by steam. This has been due not only to the increased cost of coal, but has followed the great congestion in the railroad service, which frequently has forced your company to go into the open market and purchase practically at retail, and at retail prices, the fuel which could not be delivered under its coal contracts and which was necessary in order to preserve the continuity of service.

"How far this increase in labor, material and fuel may go, of course, cannot be predicted, but with the increasing proportion of power produced by its own hydroelectric plants and the power which it will purchase from the Wisconsin-Minnesota Light & Power Company under a fixed contract, as well as the assured growth of your company, it is confidently expected that net earnings will continue to increase satisfactorily."

EXTENSION OF THE NIAGARA RIVER STEAM POWER STATION

Actual Construction for the New 35,000-Kw. Addition Will Be Begun as Soon as Weather Permits

The engineers on the design and construction of the new power station of the Buffalo General Electric Company are at work on the details for the new 35,000-kw. extension. Actual construction will be commenced as soon as weather conditions permit.



WORK UNDER WAY ON EXTENSION TO THE BUFFALO PLANT

The present turbine room is large enough to contain the new 35,000-kw. Curtis turbine-generator, but the boiler room will have to be extended to contain the entire new equipment of five 1140-hp. boilers which has been ordered. Three of these boilers can be accommodated in the present boiler room, and it is expected that they will be in operation early in the fall. Until the new generator is installed these boilers will serve principally as relays for the present five boilers supplying steam for the initial installation of 60,000 kw. The two additional boilers will be placed in an extension of the present boiler room.

The new boilers are similar in type and arrangement to those at present installed, being of the Babcock & Wilcox type fired from both ends by means of two Riley stokers, each having fifteen retorts. The boiler settings are the largest of the type yet installed and are approximately 25 ft. wide by 18 ft. deep. The present stokers are engine-driven through countershafts, but the new boilers will be turbine-driven and will be direct-connected by chain drives. The chain drive for both the present and the additional installations consists of Link Belt chains.

The new boilers will be equipped with Green's economizers similar to the initial set, and the forced draft fans will also be supplied by the Green Fuel Economizer Company. A fourth Cochrane feed-water heater is to be installed similar to the three Cochrane heaters in the present equipment. The present boiler feed consists of four-stage centrifugal pumps, which are turbine-driven, but in the new installation there will be added a spare centrifugal motor-driven boiler-feed pump. The main high-pressure steam valves, which have a working pressure of 275 lb. with 275 deg. superheat, as in the present installation, will be supplied by the Nelson Valve Company. Coal larries are to replace coal spouts for the entire boiler room.

This addition to the Niagara River power station is being carried out by the Stone & Webster organization, which designed and built the first installation.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Power of City to Make Contract.—An exclusive contract with a waterworks company to supply a city's needs to endure for forty years, subject only to adjustment of rates at the end of twenty years, is not within the power of a city to make, it was held by the Supreme Court of the State of Montana (162 P. 381).

The Constitution of Entry for Survey of Eminent Domain.—The rights given by law to corporations, including power companies, to enter on land to make examinations and surveys, etc., are based on the sovereign power to take, injure or destroy the property of others through its appropriation and devotion to a public use, it was held by the Supreme Court of Alabama in the case of Dancy vs. Alabama Power Company (73 S. 901).

Right of Commission to Enforce Duties.—The right of the Public Service Commission to enforce legal duties and to prevent violations of law by mandamus under Public Service Commission law is established, and cannot be defeated because the Attorney General may have the right to institute forfeiture proceedings against the offending public utility, it was held by the Supreme Court of New York in Public Service Commission for First District vs. Richmond Light & Railroad Company (163 N. Y. S. 64).

Action for Loss by Fire Occasioned by Electricity.—Where plaintiff suffered loss by fire which evidence shows started at a point on electric wires owned by defendant, the Northern California Power Company, and which in the ordinary course of events would not have happened if the power company had used proper care, under the doctrine of *res ipsa loquitur* a prima facie case of negligence by defendant was shown, and the burden of excusing such negligence was upon the defendant, it was held by the District Court of Appeal, Third District of California, and a rehearing was denied by the Supreme Court (162 P. 412). Evidence showing that the electric wires produced in court by the power company were not the ones in use at time of plaintiff's loss by fire was admissible not as *res gestae*, but in the nature of an admission that defendant had no defense except by fabricating evidence. Defendant's requested instruction that "the defendant cannot be held liable for any defective wiring in the tank-house" was properly refused where there was no evidence to show that such wiring was defective, the claim being that plaintiff's loss by fire was caused from defects outside the house and not from faulty interior wiring.

Reasonableness of Order Regulating Rates.—In a city's proceeding before the Public Service Commission against a manufacturer and distributor of gas the evidence tended to show an exorbitant rate for gas in the city and that a reduction in rates would increase the sales or consumption. The Supreme Court of Missouri held (191 S. W. 412) that an order of the commission fixing lower rates for the gas company temporarily, merely to make a test, that the real question of a reasonable rate might be ultimately determined, the order leaving the latter point open, was not unreasonable. In such a proceeding the fact that other cities of similar population were procuring gas at a much less rate than defendant company charged was evidence of the fact that its rate was unreasonable as charged by the city concerned.

Damages for Diversion of Water.—Where the York Haven Water & Power Company wrongfully diverted the waters of a stream so that they no longer flow past the plaintiff's farm, the measure of plaintiff's damages is the difference in value of the farm before and after diversion, it was held by the Supreme Court of Pennsylvania (99 A. 798). Residents of the locality familiar with the farm and other real estate who had knowledge of the value of land in the vicinity may give their opinion as to the amount of damages. The plaintiff may recover damages for loss of moisture which formerly rose from the water and was precipitated as dew upon his land. After the affirmation of a decree directing the removal of a dam, defendants neglected for some months to carry it out. The court held that in this case there was such a wanton disregard of plaintiff's rights that he might recover punitive damages, and that an award of $500 for punitive damages was not excessive where the actual damages amounted to over $4,000.

Responsibility of Employer for Negligence.—The foreman of a telephone and telegraph company directing the work of attaching a cable to a messenger wire along the company's poles was a vice principal, rendering the company responsible for his negligent default in failing properly to warn an employee of the defects in the transformer on the adjacent poles of a power company and of the dangers incident to existing conditions, it was held by the Supreme Court of North Carolina (91 S. E. 354). Where the telephone employee went on a power company's pole in the absence of any contract or agreement giving either the employee or the telephone company the right to be upon the power company's poles, both the telephone company and its employee were trespassers, and the power company was not liable to the employee for an electric shock received by him through defect in a transformer, since the established principle in the law of negligence that there is no liability to trespassers, except for injuries willfully or wantonly inflicted, is applicable to electric companies and electric appliances.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Income from All Telephone Lines the Basis of Rates.—An order of the Pennsylvania Public Service Commission, directing the Bell Telephone Company of Pennsylvania to reduce its rates about $1,000,000, holds that the income from all lines in the State rather than the income from any particular community must be made the basis of the charges. The company is directed to install measured service instead of unlimited service in Philadelphia and Pittsburgh.

Supplemental Order by California Commission in Oro Case.—The Railroad Commission of California has issued a supplemental order to the decision authorizing the Pacific Gas & Electric Company to buy certain of the properties of the Oro Electric Corporation. The company has filed stipulations that it will not claim before any public body values for franchises obtained in this deal greater than original cost, that it will pursue a liberal policy of extension of electric development in the territory, etc.

Massachusetts Board Alters Order When Company Changes Plans.—By an order of Nov. 21, 1913, the Massachusetts Board of Gas and Electric Light Commissioners approved the issue by the Amesbury Electric Light Company of 1500 shares of additional capital stock at 100, of which the proceeds of 600 shares were to be applied to the payment of an equal amount of the cost of additions to the generating equipment made subsequent to June 30, 1913. After the issue of the 600 shares, but before the devotion of the proceeds to the purpose specified in the order, the company entered into an arrangement for the purchase rather than generation of the electricity supplied to its customers, and abandoned its contemplated additions to its generating equipment. Subsequent to June 30 and prior to Jan. 1, 1917, the company expended more than $60,000 upon extensions of its distribution system, which expenditures were represented in its floating debt outstanding on a later date. The company requested the board to amend the order of Nov. 21, 1913, so as to permit it to apply the proceeds of the 600 shares to its floating debt. The board has ordered that so much of the order of Nov. 21, 1913, as requires the application of the proceeds of 600 shares to the payment of an equal amount of the cost of additions to its generating equipment made subsequent to June 30, 1913, shall be rescinded and that the company shall apply the proceeds to the payment and cancellation of an equal amount of notes outstanding on Jan. 1, 1917, and to no other purpose.

Dr. Maltbie in Toledo Rate Case.—A meeting of the committee on gas and light of the Toledo (Ohio) City Council was held on April 1 to consider the electric rates of the Toledo Railways & Light Company. Dr. Milo R. Maltbie, representing the city of Toledo, was present.

National Board of Water Conservation Urged.—Charles N. Chadwick, chairman of the special committee on conservation of state waters, lands and forests of the New York Chamber of Commerce, has made a report recommending the appointment of a National Board of Water Conservation.

Western Electric Company Preferred Stock Increase.—Western Electric Company stockholders have voted to increase the preferred stock from $15,000,000 to $30,000,000. The stock is offered to common shareholders at par, payable in two installments of $50 each, on April 16 or June 30, or in full on or before April 16 if the subscriber prefers.

Kansas City Rate Reduction Accepted.—President John H. Lucas of the Kansas City Light & Power Company has notified the Missouri Public Service Commission that that company will accept the order reducing rates. The new maximum rates, effective on April 17, will be 8 cents per kilowatt-hour for the first 3 kw.-hr., and 5 cents thereafter.

New York City Asks Reduction in Flatbush Rates.—At a hearing before the New York Public Service Commission, First District, on April 6, Dr. Milo R. Maltbie, City Chamberlain of New York, appearing for Mayor Mitchel, announced that he would ask for a reduction in the maximum electric rate of the Flatbush Gas Company from 12 cents per kilowatt-hour to 8 cents plus 0.5 cent for lamp renewals.

Connecticut Companies Consolidated.—The East Haddam Electric Light Company and the Colchester Electric Light Company have been consolidated as the Central Connecticut Power & Light Company, with headquarters at East Hampton, Conn. The new company will continue to serve the same towns. In three years the property has increased its customers and receipts fifteen times. Arthur B. Lisle is president of the new company and L. P. Perry general manager.

Washington - Idaho Company Improvement Plans.—Deeds have been recorded in Idaho covering the sale by the Lewiston-Clarkston Improvement Company of its electric power plants and irrigation system to the Washington-Idaho Water, Light & Power Company. The latter company was organized recently by Liggett, Hichborn & Company of New York and Boston. The consideration was $800,000. A mortgage in favor of the Equitable Trust Company of New York was also recorded. This authorizes a present bond issue of $600,000 and $400,000 to meet future developments. The plans of the purchasers contemplate construction of a dam in the Snake River three miles below Lewiston, which will develop 50,000 hp.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Municipal Ownership Plan Defeated at Faribault, Minn.—At the election on April 4 in Faribault, Minn., the question of whether the city should distribute and sell electricity was decided negatively by a vote of approximately 1100 to 400.

New Directors of Cities Service Company.—At the annual meeting of stockholders of the Cities Service Company, held in Dover, Del., on April 3, J. C. McDowell, in general charge of the natural gas and oil operations, and M. R. Bump, chief engineer of the Doherty organization, were elected new directors. The stockholders voted an increase in the authorized amount of preferred stock from $60,000,000 to $100,000,000, and in the authorized amount of common from $40,000,000 to $50,000,000.

Large Central Station Flashing Sign at Portland, Me.—Although the Cumberland County Power & Light Company of Portland, Me., occupies offices in a comparatively old building in Monument Square, the business center of the city, the company has contributed in a striking manner to the electrical advertising illumination facilities of the place by a flashing sign. The sign extends across a front of about 60 ft., above and below the third-story windows, and emphasizes the triple service rendered by the company. It contains 704 white lamps and 302 red lamps, all of the 10-watt size, the different designations being operated on a flasher with arrow "service" signs. The company's installation also includes a rectangle of 10-watt red lamps carried along the cornice and dropping vertically to a horizontal run of lamps just above the first story.

Opposition to Metric System.—The American Institute of Weights has been formed, with offices at 20 Vesey Street, New York, to oppose "a propaganda for the adoption" of the metric system. The officers are: W. R. Ingalls, president; Henry D. Sharpe and D. H. Kelly, vice-presidents; Walter M. McFarland, treasurer; Frederick A. Halsey, commissioner and secretary. The council is composed of John F. Farrell, Frederick A. Geier, E. M. Herr, A. C. Humphreys, W. R. Ingalls, D. H. Kelly, Henry M. Leland, William Lodge, Walter M. McFarland, Henry D. Sharpe, Stevenson Taylor, Charles N. Thorn, Henry R. Towne, W. R. Warner and W. H. Van Dervoort. Six others are to be elected. Two bulletins have been issued to further the purpose of the organization, "The Six Metric Myths" and "Indorsements That Count." Copies will be sent free to any address on request.

British Engineering Profession Relief Fund.—Contributions to the fund of the Professional Classes War Relief Council, Inc., which were urged in a notice published in the ELECTRICAL WORLD on March 24, 1917, have not reached the amount desired. From 1072 contributors there has been received $10,711. It is felt by those who are interested in the fund that electrical engineers have not contributed as generously as could be desired. The movement is intended to relieve families of professional men in Great Britain, many of whom are experiencing privation. Contributions may be sent to Lewis B. Stillwell, treasurer, care the Farmers' Loan & Trust Company, 475 Fifth Avenue, New York.

Inclined Coal Mine to Be Electrically Operated.—The Canton (Ill.) Gas & Electric Company has closed a contract to supply electrical energy to a coal mine of the Big Creek Coal Company of Chicago, at St. David, Ill., five miles southeast of Canton. This installation will be unusual in that it will serve a mine which is not of the ordinary hoist and shaft type, but is known as an inclined mine. The mine is constructed so that the coal is delivered directly from a side hill to the ground level and is then carried to the tipple on an endless chain incline. The capacity of this mine is about 1500 tons per day. The electrical installation will include about 500 hp. in motors of various sizes, which will be installed to operate all the machinery used in and at the mouth of the mine. The power will be delivered over the central station company's 13,000-volt transmission line, which now extends through St. David. It is planned that an installation of 450 kva. of step-down transformers will be used to displace the coal company's old steam equipment.

Cleveland's New Electrical Inspection Ordinance.—The amended ordinance under which the electrical inspection department of the city of Cleveland operates was amended recently. One section provides that for each extra inspection made necessary by faulty construction or inaccurate information on permit an extra charge of $1 shall be made. Another section says: "If upon inspection the city electrician shall find that an electric meter registers more watt-hours than it should, he will then order the same to be replaced by another meter reading correctly, at the expense of the company owning such a meter, and the inspection fee of $1 shall be returned to the person making the application." There is nothing about the usual 3 per cent leeway in the correctness of the meter reading. Another section prohibits the use of wood molding after Jan. 1, 1917. The same section also prohibits concentric wiring. In assembly halls and similar buildings, except theaters, no provision is made for the proper control of lights at some point near the main entrance. The ordinance also allows 750 watts for branch circuits with a maximum of twelve sockets. In other respects than those mentioned the ordinance follows closely Code requirements.

Cleveland Electrical League.—Charles F. Kettering of the Domestic Engineering Company of Dayton addressed the Electrical League of Cleveland on April 5.

Electric Hoisting in Mines.—H. L. Hall will address the Denver Section of the American Institute of Electrical Engineers on April 21 on the subject of "Electric Hoisting in Mines."

Chicago Section, A. I. E. E.—"Economic Industrial Applications of Electricity" is the subject of the meeting of the Chicago Section of the American Institute of Electrical Engineers that will be held April 23.

Central Station Construction Discussed Before Pratt Institute Engineers.—On April 10 E. B. Meyer, assistant to the chief engineer of the Public Service Electric Company of New Jersey, delivered an illustrated lecture before the electrical engineers of Pratt Institute, Brooklyn. The subject was "Description and Construction of a Modern Electric Generating Station."

New York Section, I. E. S.—"Evolution of Light Projection" was the title of the paper presented by C. A. B. Halvorson and R. B. Hussey of the General Electric Company, Lynn, Mass., before the Illuminating Engineering Society of New York. R. B. Thompson, Central Hudson Gas & Electric Company, Newburgh, N. Y., presented a paper on "Development of a Permanent Street Lighting Plant for a Small City or Village."

Transmission and Distribution Committee Meeting of the O. E. L. A.—The transmission and distribution committee of the Ohio Electric Light Association will hold its next meeting at Canton, Ohio, on April 18. F. H. Golding, manager of the Central Power Company, Canton, will deliver the address of welcome. R. L. Allen, engineer, with the Archbold-Brady Company, Syracuse, N. Y., will read a paper on "Design and Structural Advantages of the A-Frame Steel Tower," and A. O. Austin, chief engineer of the Ohio Insulator Company, Barberton, will deliver a paper on "Insulator Developments for 1916." After luncheon there will be a trip of inspection through a number of factories at Canton.

Detroit-Ann Arbor Section of A. I. E. E.—Paul M. Lincoln, past-president of the American Institute of Electrical Engineers and electrical engineer of the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., addressed the Detroit-Ann Arbor Section of the A. I. E. E. at a banquet given March 31 in Detroit. Among others who spoke were Peter Junkersfeld, vice-president of the society and assistant to the vice-president of the Commonwealth Edison Company, Chicago; C. F. Hirschfield, chief of the research department of the Detroit Edison Company, and Prof. J. C. Parker, head of the electrical engineering department of the University of Michigan. The chairman of the evening was A. A. Meyer of the Detroit Edison Company.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Electrical Machinery and Supplies.—Earl Buckingham, associate member of the American Society of Mechanical Engineers, recently addressed that body in New York, presenting an illustrated talk on "Standards of Business Success." He showed the results of his investigation along eight different lines of business, one of them being electrical machinery and supplies.

Kansas Branches of A. I. E. E. Meet.—C. H. Taylor, representative of the Westinghouse Electric & Manufacturing Company, F. B. Uhrig of the Western Electric Company, J. T. Skinner of Lawrence and H. P. Cady of the Kansas State University faculty were the speakers at the ninth annual electrical engineers' day at the University of Kansas, Lawrence, Kan., March 28. The meeting was a joint session of the university and the Kansas branches of the American Institute of Electrical Engineers.

Annual Convention of the Southwestern Electrical and Gas Association.—The thirteenth annual convention of the Southwestern Electrical & Gas Association will be held in the Adolphus Hotel, Dallas, Tex., on April 26, 27 and 28. The morning of the first day of the convention will be devoted to an address of welcome, the president's address, election of new members, the appointment of the convention committee and similar business. The street and interurban railway sessions will be held on the afternoon of the same day and the morning of the next day. The gas sessions will be held at the same time as the street and interurban railway sessions, but in separate rooms. The electric light and power sessions will be held on the afternoon of April 26 and the morning of the following day. The general session will be held early in the afternoon of April 27, followed by the business session, at which the reports of the treasurer and all committees will be presented and officers and standing committees for the coming year will be elected. It was thought best by all three of the committees to devote one of the sessions to practical operating subjects and the other session to executive and administrative matters and to matters of public policy. Class B members, who are to be the principal hosts of the convention this year, have laid out a liberal plan of entertainment for the attending members, visitors and guests. The Dallas Electric Club has also arranged to entertain the visiting ladies. A rejuvenation will be held on the evening of April 27, a special entertainment having been arranged to take place on that evening.

Spokane Section, A. I. E. E.—"High-Tension Transformers" and "Electrolysis" are the subjects to be discussed before the Spokane Section of the A. I. E. E. on April 20.

Electrical Supply Jobbers' Association.—The ninth annual meeting of the Electrical Supply Jobbers' Association will be held May 22 to 24, at the Homestead Hotel, Hot Springs, Va.

Empire Gas and Electric Association.—Methods of installing and testing large-capacity watt-hour meters will be discussed by the electric meter committee of the Empire Gas and Electric Association in the United Engineering Societies Building, New York, April 13.

Ithaca Section, A. I. E. E.—The Ithaca Section of the American Institute of Electrical Engineers recently held a meeting at which J. D. Stahl spoke on "The Electrical Features of the Panama Canal." T. G. Spates addressed the club on "The Problems and Possibilities of the Central-Station Industry."

May Meeting of the A. I. E. E.—The annual business meeting of the American Institute of Electrical Engineers will be held in New York at the Engineering Societies Building on May 18. At this meeting the report of the Board of Directors is to be presented and announcement made of the election of officers for the ensuing year.

Insulating Materials.—L. E. Barringer, engineer in charge of insulations for the General Electric Company, addressed the Pittsfield (Mass.) Section of the American Institute of Electrical Engineers on the subject of "Insulating Materials," at a recent meeting. After commenting on the great difficulties in the way of forming a working theory upon which to base the design of insulations, Mr. Barringer took up the characteristics required for various classes of service and explained how the materials available met these requirements. Some must be capable of withstanding high temperatures, some must be good heat conductors and others good heat insulators, while still others must have great mechanical strength.

Twenty-third Annual Convention of the O. E. L. A.—The Ohio Electric Light Association will hold its twenty-third annual convention, July 16-20, 1917, at the Breakers Hotel, Cedar Point, Ohio. The tentative program is as follows: The first session will include the president's address, reports of the secretary-treasurer and executive committee, election of new members and similar business. On Tuesday the meter committee will report, and W. S. Barstow, New York City, and one of the electrical engineers of the Bureau of Standards will give addresses. Wednesday morning's session will be devoted to new-business subjects. Addresses will be delivered on Wednesday afternoon by H. C. Eddy, H. O. Loebell, C. I. Crippen, J. C. Matthieu and C. E. Torrey. Station-operating subjects will be discussed on Thursday morning, and transmission and distribution problems on Thursday afternoon.

WASHINGTON DEVEREUX

Washington Devereux, chief of the electrical department of the Philadelphia Fire Underwriters' Association, has been elected president of the National Association of Electrical Inspectors. Since 1880, when he became connected with the Bell Telephone Company of Pennsylvania, Mr. Devereux has been constantly engaged in the electrical industry in the United States and the West Indies. His society affiliations include most of the great national electrical associations. He is author of "Electrical Key," the standard work for use of the Electrical Inspection Bureau, and is the originator of the electrical conference which consists of inspectors and district managers of the Philadelphia Electric Company, municipal inspectors, electrical contractors and mechanics, and inspectors of the Philadelphia Fire Underwriters' Association. This conference meets once a month to discuss code regulations, the best methods of co-operation between the various branches of the electrical industry and other electrical subjects. Besides Mr. Devereux has been prominent in Jovian activity in Philadelphia. From 1910 to 1912 he was statesman of the Jovian Order from the Eastern District of Pennsylvania.

A. C. Hathaway has resigned his position as assistant general manager of the Virginia Railway & Power Company at Norfolk, Va. Mr. Hathaway is succeeded by T. Norman Jones, Jr.

Arthur Kempston, now in charge of overhead construction for the city of San Francisco, has been appointed chief of the city's department of electricity, succeeding James M. Barry, who resigned to become engineer of distribution with the Great Western Power Company. Ralph W. Wiley succeeds Mr. Kempston.

M. C. Whiting, assistant general superintendent of the Cairo Railway & Light System, has resigned to accept the position of general manager of the International Silica Company of Cairo, Ill. Mr. Whiting was with the Cairo lighting system for six years. Previous to that time, after his graduation from the University of Illinois in 1908, he was with the Galesburg Railway, Light & Power Company.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

C. W. Sanders has been appointed operator at the Tacoma municipal power plant at La Grande, Wash.

F. S. Morrison has been appointed assistant operator at the Tacoma municipal power plant at La Grande, Wash.

H. H. Barnes, Jr., engineer for the General Electric Company, after an illness of three months is again taking up his duties in New York.

H. R. Lanning has been appointed chief operator of the Tacoma municipal power plant at La Grande, Wash., succeeding Henry Abbott, who recently resigned.

Ralph W. Wiley succeeds Arthur Kempston, who has been appointed chief of the department of electricity of San Francisco, in charge of overhead distribution for the city.

W. W. Scherer, who was formerly associated with the testing laboratory of the Pacific Gas & Electric Company, has become identified with the Western Electro-Mechanical Company of Oakland, Cal., manufacturer of electrical testing instruments.

Harry H. Lyons, for the last five years connected with the Arkansas Valley Railway, Light & Power Company at Pueblo, Col., has been appointed district superintendent of the new division of the company which includes Ordway, Sugar City, Crowley and Olney Springs.

H. C. Hoagland has been transferred from Muskogee, Okla., to Oklahoma City, where he will take up the duties of vice-president and general manager of the Central Oklahoma Light & Power Company. Mr. Hoagland goes to Oklahoma City after a service of about half a year in Muskogee, where he had charge of the H. M. Byllesby & Co. plants in Muskogee, El Reno and Oklahoma City. Prior to that he was general manager of the Fort Smith (Ark.) Light & Traction Company.

Henry F. Holland, who was appointed manager of the electric range department of the Great Western Power Company, San Francisco, Cal., only a few months ago, has severed his connections with that company and returned to Los Angeles, following the action of the company on March 1 in the abandonment by it of its range department with all its activities. For the present Mr. Holland's address is 1928 Highland Avenue, Hollywood, Cal. Mr. Holland has been closely identified with electric heating for the past ten years or so and has been very active in Jovian circles on the Pacific Coast. Before going with the Great Western he was Pacific Coast representative of the Simplex Electric Heating Company.

DUDLEY FARRAND

Dudley Farrand, for many years general manager of the Public Service Electric Company of New Jersey, has been promoted to be assistant to Thomas N. McCarter, president of the parent company, the Public Service Corporation of New Jersey. Mr. Farrand was born in Bloomfield, N. J., in 1869. He entered Princeton College with the class of 1891, but left before the completion of his course to become connected with the Newark (N. J.) Electric Light & Power Company, of which he became a director in 1891. Five years later he was made assistant general manager of the People's Light & Power Company, becoming general manager in the following year. The United Electric Company of New Jersey was formed in the spring of 1899 with Mr. Farrand as general manager. This company, the forerunner of the Public Service Electric Company, served a large portion of the State. Later when the electric interests were consolidated with large railway interests under the Public Service Corporation of New Jersey Mr. Farrand continued in charge of the electric department. Mr. Farrand has been closely associated with national electrical associations, having been elected secretary of the National Electric Light Association in 1904 and president of the association in 1907.

Daniel L. Turner, who has been acting chief engineer of the Public Service Commission for the Second District of New York since the appointment in November last of Alfred Craven as consulting engineer of the commission, has been appointed chief engineer of the commission.

Obituary

Joseph Phineas Davis, chief engineer for the American Telephone & Telegraph Company from 1880 to 1905, died at his home in Yonkers, N. Y., on March 31. Mr. Davis was born at Northboro, Mass., in 1837 and received his engineering education at the Rensselaer Polytechnic Institute, from which he was graduated in 1856. After serving for twenty-five years as chief engineer of the telephone company Mr. Davis retired in 1905.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

BRISK DEMAND FELT FOR ELECTRICAL WAR EQUIPMENT

New England Manufacturers Feel Activity in Market for Flood-Lighting Outfits—Increased Use of Industrial Trucks Expected

The declaration of hostilities against Germany has greatly stimulated the demand for electrical war material produced in New England. One large manufacturer of flood-lights is almost overwhelmed with orders following the completion of plans for guarding bridges and other strategic points. In one day last week orders for 1400 such units were received. So great is the urgency that the cast-iron parts, which are the most difficult portions of the equipment to procure, are being shipped to the factory by express. Several types of reflectors are used.

It is predicted that shortage of industrial labor resulting from the mobilization of land and sea forces can be met in part, so far as factory transportation is concerned, by the use of industrial electric trucks. A widespread demand for this equipment is likely to be seen in the early future, together with a demand for small motors of a wide range of sizes. Turbo-lighting sets, also, for marine work are certain to be sold in increasing numbers.

Some uncertainty exists as to the future course of material prices, in view of the action of certain producers of bulk metal in offering to supply material far below the present market level for governmental use. Readjustments in the interests of patriotism should be possible without serious difficulty so far as war material supply goes, and the ultimate destination of material should be taken into account in mobilizing the industrial resources of the country for the most efficient prosecution of the war.

INCREASE OF 500 PER CENT IN THE PROJECTOR MARKET

Big Demand for Protective Purposes from Industrial Plants, Central Stations and Railroads Is Now Felt

During the last month the demand for flood-lighting projectors has increased 500 per cent. Manufacturers are now trying to turn out in one day the quantity that they have been accustomed to turn out in a week. The bulk of the increase came during the first week after President Wilson's memorable speech to Congress, two weeks ago.

Industrial plants, the government, light and power companies, railroads—these have been the largest purchasers of projectors. In most cases the units have been purchased as protection against enemies of the country. Power plants are using them to bathe dams and stations in a flood of light, railroads to light up points of strategic value on their lines, and industrial plants to light up all of the immediately surrounding territory. Flood lighting, it has been found, offers a better protection at night than is gained by any other means, besides enabling the companies to get along with fewer guards. Thus, from a labor standpoint alone, there is an argument for flood lighting.

In addition to the demand for protective purposes there is a very noticeable demand for projectors for increasing production. The government has removed the eight-hour handicap from both shipbuilding plants and munition works on government contracts. As a result, these plants are working on twenty-four-hour schedules, and flood lighting is finding a large use for night work. Most of the projectors are sold for outside use, although there have been many sold for inside work.

This increased demand started a few weeks prior to the actual declaration of war. A number of industrial plants, anticipating the government's action, purchased projectors. The market, however, was flooded with orders immediately after the President's speech. So great has this demand been, and so unexpected was it, that manufacturers are now weeks behind in deliveries, and as the orders pour in the situation becomes worse.

Coupled with this demand is a very embarrassing raw-materials situation. Premiums have to be paid on almost all items entering the construction of projectors. Steel and iron castings, screws, bolts and glass are very difficult to obtain, particularly glass.

The government, it is understood, is in the market for quantities of projectors for use in various field and marine operations. It is expected that the mosquito fleet will be equipped with individual projectors for each submarine chaser. In case orders develop from this direction they will take precedence over all other orders, and deliveries will be delayed by just so much.

JANUARY ELECTRIC EXPORTS COME TO ALMOST $5,000,000

Foreign Trade During First Month of Current Year Totals More Than Double the Sum That Was Reached During January, 1916

The year 1917 opened auspiciously for electrical exports, the total for January being $4,912,924. In comparison with January, 1916, this represents an increase of $2,600,000, or over 100 per cent.

Exports of batteries, insulated wire, tungsten filament lamps and motors were the largest in that month that they have been since the beginning of the war. Insulated wire, which was the largest single item in the month's exports, amounted to over $800,000.

Conspicuous figures are those for insulated wire and cable and for motors. During the last year and a half the exports of these articles have been increasing almost constantly. To a certain extent, of course, these increases can be accounted for by the increase in price. In the last eighteen months insulated wire and cable has practically doubled in price. Even on this basis, though, there has been an actual gain in volume of wire exported. The prices of motors, of course, have increased to a considerable extent, but it is doubtful if the prices have increased to such an extent as to offset the apparent gain in exports.

For the seven months ended Jan. 31, 1917, the electrical exports of American manufacturers amounted to $28,217,968, compared with $15,638,569 for the corresponding seven months of the year previous. As just pointed out, the increase here, which is almost 100 per cent, can be accounted for to a considerable degree by increase in prices. There has been, however, a marked increase in the demand of foreign markets for American goods. Many markets which at the beginning of the war were stocked with goods manufactured by other nations hesitated for a long while before buying goods of American manufacture in the expectation that the war would be of short duration and that it would again be possible to stock up on regular lines. Stocks, however, have become depleted, and peace still seems far away; consequently it has become necessary to purchase elsewhere. As a result American goods have entered markets in which formerly they were never represented.

In the accompanying tables are shown in detail the exports of electrical merchandise as compiled by the Bureau of Foreign and Domestic Commerce:

Articles	January 1916	January 1917	Seven Months Ended January 1916	Seven Months Ended January 1917
Batteries	$115,354	$379,781	$822,212	$1,542,053
Dynamos or generators	56,983	271,742	852,748	1,466,111
Fans	16,010	43,660	203,829	188,522
Insulated wire and cable	265,622	808,579	1,701,393	4,030,688
Interior wiring supplies, etc., including fixtures	87,611	133,140	495,471	623,672
Arc lamps	1,203	973	10,407	6,951
Carbon-filament lamps	14,667	15,470	102,995	83,702
Metal-filament lamps	109,720	181,785	684,364	894,699
Meters and other measuring instruments	75,352	94,575	448,951	576,034
Motors	389,380	659,620	2,283,042	3,267,139
Telegraph instruments (including wireless apparatus)	5,802	24,808	93,575	173,388
Telephones	69,050	132,807	448,932	997,312
Transformers	55,708	133,539	520,535	656,341
All other	1,058,360	2,032,445	6,970,115	13,711,357
	$2,320,822	$4,912,924	$15,638,569	$28,217,968

CONDITION OF MARKET FOR CODE RUBBER-COVERED WIRE

Stocks Below Normal with Little Improvement in Deliveries—Favorable Opportunity for Jobbers in Securing Better Profits

Conditions as they now obtain in the market for National Code rubber-covered wire are discussed by M. A. Oberlander, Western Electric Company, as follows in the current issue of *The Reminder*, published by the Electrical Supply Jobbers' Association:

"From what I can learn the manufacturers' and jobbers' stocks are low—in other words, practically below normal—especially so on stranded sizes.

"There does not seem to be much improvement in the way of deliveries. Where manufacturers do not have in stock the size of wire required, it takes at least four to six weeks to make shipment. The prospects for an improvement are very slim, especially on account of the difficulty the manufacturers are having in securing raw materials.

"The demand for wire seems to continue to grow and there does not seem to be any sign of a let-up; in fact, if anything, conditions are likely to grow worse, for the government, as you are aware, is beginning to place large orders.

"Price conditions are very much better than they have been, and there is no reason why they should not continue to improve, as from what I can learn from the majority of purchasers, it is principally a question of delivery at this time, and price is a secondary consideration. In other words, we are still on a seller's market, and there is no reason why we cannot obtain a favorable profit, especially on material that we have in stock.

"I would caution all to be careful in taking any contracts on wire, for the reason that should there be any decline in price you will find your customers canceling their orders, and as a rule the jobber is always made the 'goat' in such instances.

"From my observation there are no signs of lower market prices for some time to come. For example:

"Rubber-covered wire, 1916 over 1915, increased 41 per cent.

"Copper—1916, 0.34; 1915, 0.19; increased 81 per cent.

"Rubber—1916, 0.75; 1915, 0.59; increased 27 per cent.

"Cotton—1916, 0.32; 1915, 0.21; increased 54 per cent.

"In the event of there being war, there is no question that there will be an enormous increase in the purchase of copper; on the other hand, should there be peace, we must realize that the Central powers have not been buying any copper for the past two years, and their requirements, in my opinion, will easily offset the purchases that are now being made in excess by the Allied powers. I cannot therefore help but foresee a high price for copper wire for at least a year or more.

"In summing up the situation, the jobbers now have a favorable opportunity for securing better profits than they ever had in the past, and there is no reason whatever why we should not all be able to sell rubber-covered wire on the basis of market prices and yet make a satisfactory profit."

MARKET CONDITIONS OF THE WEEK UNCERTAIN

Some Manufacturers Report Diminution of Incoming Orders and Others Have Had Unusually Large Business

During the past week the market for electric goods has been very uncertain. Some manufacturers have seen a decided falling off in orders, while others equally large and important have not only felt no diminution in orders but actually experienced unusually large business.

There are predictions of every kind for the immediate future, but it is doubtful if any are more than personal opinions or guesses. Undoubtedly there will be a big demand for electrical material for war purposes, but the demand for regular uses is highly uncertain.

Certainly there has already been a large demand for certain kinds of electrical equipment, not for war purposes, but occasioned by the war. One instance of this is to be found in the market for flood lamps discussed on the preceding page, and this is typical of others.

COPPER MARKET CONDITIONS ARE BROUGHT TO STANDSTILL

Both Buyers and Sellers Await Developments, with General Expectations of Price Concessions in Near Future

Since the entrance of the United States into a state of war the copper market has come practically to a standstill. Buyers and sellers are both awaiting developments. There is a rather widespread feeling that prices will be lower owing largely to the fact that a considerable portion of the production for the second half of the year remains unsold.

Copper for export to the Allies must surely be sold at a lower price because the United States is now at war with the common enemy. There are many other reasons offered by buyers for expecting price concessions, although there is great uncertainty regarding the probable effect of active war on construction in the United States.

Quotations, which, of course, are nominal, were considered lower on Tuesday of this week than a week previous. Electrolytic sold at 33.5 cents for April shipment, 32.75 cents for May, 32.5 cents for second quarter, 30.25 cents for third quarter, and 29.25 cents for fourth quarter.

NEW YORK METAL MARKET PRICES

	April 3 Selling Prices Bid	April 3 Selling Prices Asked	April 10 Selling Prices Bid	April 10 Selling Prices Asked
Copper:	£ s d		£ s d	
London, standard spot	136 0 0		136 0 0	
Prime Lake	34.00 to 34.50†		33.50 to 34.00†	
Electrolytic	33.75 to 34.25†		33.25 to 33.75†	
Casting	30.75 to 31.25†		30.75 to 31.00†	
Copper wire base	39.00 to 41.00†		39.00 to 41.00†	
Lead	9.00		9.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	21.00		21.00	
Spelter, spot	10.55 to 10.67½		9.92½ to 10.17½	
Tin, straits	54.37½		54.70	
Aluminum, 98 to 99 per cent	55.00 to 57.00		55.00 to 57.00	

OLD METALS

Heavy copper and wire	28.00 to 29.00	27.50 to 28.50
Brass, heavy	17.50 to 18.00	16.50 to 17.00
Brass, light	13.00 to 13.50	12.50 to 13.00
Lead, heavy	7.50 to 7.75	7.50 to 7.75
Zinc, scrap	7.75 to 8.00	7.50 to 7.75

†Nominal.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Heating Unit for Electric Range

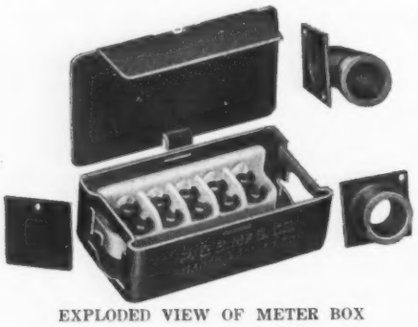
The Rutenber Electric Company of Marion, Ind., has developed a heating unit of the open-coil type for its ranges. The resistance elements are arranged in two double clover-leaf patterns, one

CLOVER-LEAF TYPE OF HEATING UNIT FOR ELECTRIC RANGE

larger than the other, nichrome wire being used and laid in deep wide grooves in a firite plate 1 in. (2.54 cm.) thick and 8 in. (20.3 cm.) in diameter. With this arrangement excellent radiation is permitted and the centers of the coils are prevented from being the hottest points. No long coils are exposed; each coil is pinned down at each turn, so that it is impossible for a coil to get out of its groove or expand and possibly become short-circuited by a metal vessel making contact with two coils.

Universal Watt-Hour Meter Box

The James E. Gleason Company, 106 South Clinton Street, Chicago, Ill., is marketing a type of watt-hour meter box which, with a few terminal fittings, is said by the manufacturer to take the place of thirty-five different styles of



EXPLODED VIEW OF METER BOX

similar boxes. The fittings and the ends of the box are arranged so that the parts are interchangeable, thereby making it possible to change the direction of energy transfer through the box by changing the relative positions of the terminal fittings. The box has the additional advantage that it can be sealed to protect the service against unauthorized connection. The interchangeable terminal fittings are shown in the accompanying illustration. The meter box is being manufactured by the P. & B. Manufacturing Company.

Outdoor Conduit Fitting

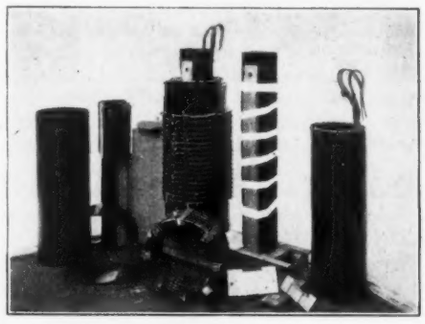
An improved galvanized weatherproof fitting for outside conduit construction has been developed by the Utility Fittings Company, 812 Walnut Street, Philadelphia, Pa. This device is for use where a neat, short right-angle turn is necessary and can also be used for a pull box. It has a smooth interior and well-rounded corners, which facilitate drawing of the wires and minimize chance of injury to the conductor insulation. The threads for the closure cap are on the exterior of the fitting. The closure cap has a

Y TYPE OF CONDUIT FITTING FOR OUTSIDE CONSTRUCTION

smooth interior flange, thus when securely seated on the fitting, which is also turned smooth, a waterproof outlet box is obtained, it is asserted. In the accompanying illustration is shown a type of Y fitting which is particularly adapted for conduit-service entrance to buildings.

Core-Type Transformers

Core-type construction is used for small and moderate-size high-voltage transformers by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The high-tension conductors have small cross sections and in most designs consist of a number of turns and layers of small round wires. By taping and impregnating the coils thus formed, mechanically strong and rugged transformers result. Concentrically arranged coils are employed, the low-tension winding being on the outside separated from the high-tension winding by a heavy insulating barrier of bakelite-micarta in the form of tubes. The tubes are strong mechanically, have a high dielectric strength, and are unaffected by oil. Ample ventilation is secured in both high-tension and low-tension windings

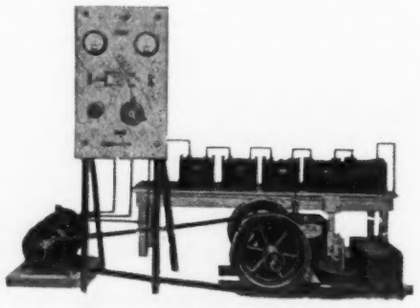


AN UNASSEMBLED VIEW OF A CORE-TYPE TRANSFORMER

by means of liberal-size ventilating ducts. The coils are protected from distortion which may result from heavy overload or short circuit by rings of wood and micarta bearing against the end of the frame. This construction does not interfere with the flow of the cooling oil, the manufacturer points out.

Domestic Electric-Service Plant

A domestic electric-service plant which includes a flywheel-type dynamo with a sliding base and oil-ring bearings, a battery and switchboard has been developed by the Main Electric Manufacturing Company of Pittsburgh, Pa. The generator is rated at 40 volt, 15 amp., and the battery, which is the thick-plate type with hard-rubber jars, at 40 amp.-hr. The switchboard is of

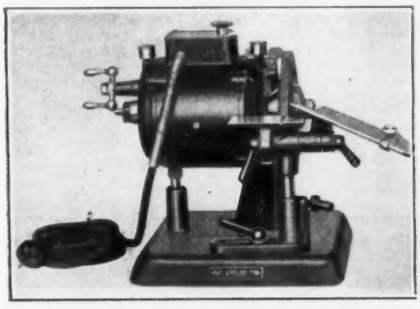


ELECTRIC-LIGHT PLANT WITH FLYWHEEL-TYPE GENERATOR

blue Vermont marble and carries a voltmeter, ammeter, automatic cutout, polished copper knife switches, field regulating rheostat, pilot lamp, etc. It is mounted on angle irons 60 in. (1.52 m.) high.

Motor-Driven Grinders

The Universal Electric Company of Newark, N. J., is marketing a line of motor-driven grinders with motors wound for all commercial voltages and frequencies in the universal type and for direct or alternating current. Attention is called to the improved type of starting switch which consists of three contact brushes, arranged with all working parts covered. The rotor can be removed or reassembled without



COMBINATION DRILL, TOOL, AND TOOL POST GRINDER

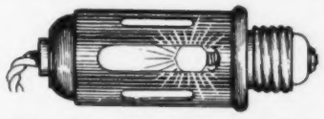
any of the difficulties encountered in rotors with lever-type switches, it is claimed. In the accompanying illustration is shown a combination of drill, tool, and tool post grinder. The motor is rated at ¼-hp., 3575 to 3550 r.p.m., and the size of the grinding wheel is 6 in. by ½ in. (15.2 cm. by 1.27 cm.).

Time-Limit Protective Plugs

Time-limit protective plugs in sheet-metal cases have been developed by the General Electric Company of Schenectady, N. Y., to be used in connection with drum-type and other small-motor starting switches. The case has a hinged cover and is provided with a hasp so that it can be locked closed. One-inch (2.54-cm.) knockout holes for conduit wiring have been provided. The line from the starting switch to the motor can be broken at any point and protective plugs inserted. The plugs can be furnished for use with any alternating-current motor rated at any value up to and including 3 hp., 110, 440 and 550 volts, and 5 hp. on 220 volts.

Pilot Lamp for Electrical Appliances

A device that shows at all times whether or not an appliance is consuming energy is being manufactured by



SIGNAL FOR USE WITH ELECTRICAL APPLIANCES

the Electric Signal Company, 1307 Sutter Street, San Francisco, Cal. The signal is in the form of a pilot lamp mounted in a brass case 4 in. (10.2 cm.) in length. The lamp is rated at 2 cp. and is connected in parallel with the appliance and glows the instant the latter is energized.

Color-Matching Unit

The St. Louis Brass Manufacturing Company of St. Louis, Mo., is producing a color-matching unit which it calls the "Spectrolite." The color-matching light is derived from a standard 60-watt "Mazda" lamp, a correction being accomplished by means of strips of glass, the color of which is so adjusted by selective absorption of the rays of light from the lamp that there is emitted only the part of the light which does not distort even the most delicate shades. The selective absorption of light is accomplished by contact of the light rays with the glass, rather than by penetration, thus providing a more efficient unit. The glass strips are disposed at a fixed angle to a line passing through the axis of the lamp and at a uniform radial distance in such manner that the emitted light must in all cases come in contact with one strip of glass from which it is reflected to the working

PORTABLE TYPE OF COLOR-MATCHING UNIT

plane. A particularly interesting feature of the unit is that with its light it is possible to see at a glance the basic hue of any color.

Reel for Lamps

A reel that consists of a ball casing containing a winding mechanism and a drum capable of winding 10 ft. (3 m.) of insulated lamp cord has been developed by the Anderson Electric Specialty Company of Chicago, Ill. The lamp does not revolve, nor does the cord twist during the winding operation. This device can be adapted for use with drop-lamps, portable lamps and the like, as well as to provide an extension lamp.

Straight-Through Switch

The straight-through or feed-through switch manufactured by the Bryant Electric Company of Bridgeport, Conn., has recently been redesigned with a resultant improvement, it is said, in mechanical and electrical efficiency. Although the over-all measurements of the switch have been reduced, the current-carrying and breaking ratings are greater. The mechanism proper is securely mounted between two substantial porcelain blocks, the make-and-break mechanism of the knife-switch character being well protected in the center thereof. The shell of the switch is provided with an interchangeable cap, so that, if desirable, the shell and body will fit into a cap which has been threaded onto and rigidly fastened to metal tubing.

Industrial Truck

Samuel L. Moore & Sons, Inc., Elizabeth, N. J., has developed a four-wheel-steel industrial truck for which several advantages are claimed over the two-

FOUR-WHEEL-STEER INDUSTRIAL TRUCK

wheel-steer type. For instance, it is possible to operate the truck in very narrow aisles and in limited turning quarters, something impossible, it is said, with a two-wheel-steer truck. In addition, the truck can enter the side doors of a standard box-type freight car and run toward either end of the car. The ability to turn in a short radius is absolutely necessary in machine shops, warehouses and railroad terminals, where all vacant space has a big value.

Lead-Burning Apparatus

Oxy-illuminating-gas apparatus especially designed for lead-burning purposes, such as is employed in storage-battery work, has been developed by Ashton, Laird & Company and is sold exclusively by the Bradford-Ackerman Corporation of New York City. The process employs either artificial or natural illuminating gas, drawn directly from city gas mains, in connection with "tanked" oxygen. Attention is called to the oxygen pressure-reducing regulator, by means of which accurate adjustment of the desired working pres-

PORTABLE LEAD-BURNING APPARATUS

sure is obtained and maintained constant at the torch until the exhaustion of the oxygen tank is complete. Two models of this system are furnished, one stationary and the other portable.

Trade Notes

THE WESTERN ELECTRIC COMPANY, INC., announces the opening of a branch house at New Haven, Conn., with complete stocks of electrical supplies.

F. C. THOMAS has resigned as superintendent of the Canadian Tungsten Lamp Company to be re-associated with the Westinghouse Lamp Company at Bloomfield, N. J.

A. MAJOR, who has traveled out of Kansas City the past fourteen years for electrical jobbing houses, has been appointed sales manager of the Missouri Valley Electric Company at Kansas City. Mr. Major was for the last eight years with the Funsten Electric Company.

PAUL D. FUQUA, who has been employed in the last two years as engineer in charge of the design and construction of the reinforced-concrete bridge for the city of Dayton, Ohio, has resigned to accept the Chattanooga (Tenn.) agency for the sale of "Delco-Light" products, taking up his new work about April 20.

THE CONTINENTAL SALES DISPLAY CORPORATION has acquired the property of the Mott-Le Gaige Animated Advertising Corporation and the Ad-Display Machine Corporation. At a meeting of the directors of the Continental Sales Display Corporation held Jan. 31, the following officers were elected: James Duane Livingston, president and treasurer; George B. Hutchings, vice-president, and James F. Tilley, vice-president and secretary.

THE DE VEAU TELEPHONE MANUFACTURING COMPANY of Brooklyn, manufacturer of interior telephones, has been merged with the business of Stanley & Patterson of New York. Al De Veau becomes secretary of Stanley & Patterson and director of factory sales in charge of the sale of the following products: Faraday signal gongs, P-R bells, Patterson battery sets, De Veau telephones and De Veau electrical specialties. Mr. De Veau's headquarters will be at 23 Murray Street, New York, the main office of the company.

GEORGE H. WAHN COMPANY, Boston, Mass., has moved to 69-71 High Street. In making the announcement Mr. Wahn writes: "Less than two years ago (May 15, 1915), we started in business, taking very small rooms at No. 54 High Street, where we stayed for three months, when we moved to our present location at 99 Bedford Street. Through what we are pleased to term 'Wahnco service,' our business has developed to such an extent that we find it absolutely impossible to continue at our present address, although our lease here does not expire for several months."

New Incorporations

THE ATHENS POWER COMPANY of Princeton, W. Va., has been incorporated by J. N. Hoylman, F. A. Bohn, R. A. Dangerfield and S. A. Shumate. The company is capitalized at $10,000.

THE ASHLEY (Ohio) ELECTRIC LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by C. F. Sperry, J. B. Johnston, C. R. Wing, E. R. Sperry and C. S. Aldrich.

THE HEALDTON (Okla.) ICE, LIGHT, POWER & SUPPLY COMPANY has been chartered with a capital stock of $15,000 by C. V. Miller, N. A. Jennings of Healdton and R. E. Martin of Wirt, Okla.

THE BUCKEYE POWER COMPANY of Steubenville, Ohio, has been incorporated with a capital stock of $9,000 by Frederick A. Boutelle, J. B. McCullough, Albert G. Lee, Clyde E. Linduff and Paul R. Bowles.

THE NAPPANEE (Ind.) UTILITIES COMPANY has been incorporated with a capital stock of $75,000 by John Hartman, Willard A. Price and Burton A. Uline. The company proposes to supply water, light, heat and power.

THE PROSPECT ELECTRIC COMPANY of Niagara Falls, N. Y., has been chartered by William A. Rix, Alfred Rix, and Herbert J. Wills. The company is capitalized at $10,000 and proposes to do a general contracting business.

THE INDEPENDENT ELECTRIC LIGHT & POWER COMPANY of San Antonio, Tex., has been chartered with a capital stock of $30,000 to construct and operate an electric-light and power plant. W. L. Cunningham is among the incorporators.

THE DURYEA ILLUMINATORS of Rochester, N. Y., has filed articles of incorporation with a capital stock of $10,000 to manufacture advertising signs and devices. The incorporators are: Harry R. Duryea, Mortina S. Duryea and Thomas A. Duryea.

THE ECONOMIC ELECTRIC COMPANY of Wilmington, Del., has been chartered with a capital stock of $500,000 to manufacture electric machines, storage batteries, etc. The incorporators are: K. M. Dougherty, C. Fearon and E. Lynch, all of Wilmington, Del.

THE VIKING SIGN COMPANY of New York, N. Y., has been incorporated by J. Acker, P. S. Van Bloom and L. T. Strauss, 74 West 125th Street, New York, N. Y. The company is capitalized at $7,500 and proposes to deal in signs, posters, lighting fixtures, etc.

THE MUTUAL COAL, LIGHT & POWER COMPANY of Gallup, N. M., has been incorporated with a capital stock of $2,500,000 to generate and transmit electricity for lamps, heaters and motors. The incorporators are: George A. Keeper, James A. Sueggon and C. C. Manning, all of Gallup.

THE MASSAM COMPANY of Springfield, Mass., has been incorporated with a capital stock of $500,000 to manufacture mechanical and electrical eqffuipment. The officers are: Charles F. Munder, president; George H. Morgenstern, vice-president, and Frank W. Arthur, treasurer, all of Springfield, Mass.

THE AUTO ELECTRIC SERVICE COMPANY of Huntington, W. Va., has been incorporated by C. H. Doebler, Sr.; F. W. Irvin, S. W. Lallance, Frank N. Eppinling and G. L. Irvin, all of Huntington. The company is capitalized at $5,000 and proposes to manufacture and deal in electrical appliances.

FOOTE, PIERSON & COMPANY of New York, N. Y., have filed articles of incorporation with a capital stock of $100,000 for the purpose of manufacturing all kinds of electrical machinery and doing a general contracting business. The incorporators are: Henry G. Pierson, M. N. Liesman and William R. Stout.

THE ARMSTRONG CONSTRUCTION COMPANY, Prudden Building, Lansing, Mich., has been incorporated for the purpose of doing a general electrical contracting business. The officers are: E. A. Armstrong, president; Arthur R. Sawyer, vice-president, and Charles M. Armstrong, secretary and treasurer.

THE PRESTON COUNTY POWER COMPANY of Kingwood, W. Va., has been chartered by B. P. Hessler, R. L. Weide of Washington, D. C.; John F. Pierce of Rowlesburg, W. A. Schaeffer and Carleton C. Pierce of Kingwood, W. Va. The company is capitalized at $5,000 and proposes to develop coal lands.

THE INSULATION DEVELOPMENT CORPORATION of New York, N. Y., has been incorporated by M. Dillon, E. Lawler and E. Rose, 12 Broadway, New York, N. Y. The company is capitalized at $5,000 and proposes to operate wire drawing, wire insulating plants and to do a general mechanical engineering business.

THE SCHUESTER ENGINEERING COMPANY of New York, N. Y., has been incorporated by H. A. Bellows, C. G. Grossman and K. R. Schuster, 21 Park Row, New York, N. Y. The company is capitalized at $100,000 and proposes to do a general construction, engineering and contracting business, and install electric systems.

THE SOUTH GEORGIA POWER COMPANY of Valdosta, Ga., has been chartered with a capital stock of $25,000 to supply electricity and to operate electric railways in Georgia. The incorporators are: Alma Roberts, Frank Roberts, William Roberts and others of Lowndes County, Ga., and B. P. Rucker of Schenectady, N. Y.

THE SOUTHERN ARIZONA UTILITIES COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $200,000 for the purpose of generating electricity for lamps, heaters and motors. The incorporators are: S. B. Howard, Harry B. Davis and A. W. Britton, all of New York, N. Y.

THE SUCCESS ELECTRICAL CORPORATION of Brooklyn, N. Y., has been incorporated with a capital stock of $10,000 by H. Bierer, G. A. Page and W. Schweikert, 1238 Rogers Avenue, Brooklyn, N. Y. The company proposes to do a general electrical and mechanical engineering business and deal in electrical supplies, etc.

THE HUDSON POWER CORPORATION has filed articles of incorporation with the Secretary of State with a capital stock of $3,000,000 for the purpose of furnishing gas and electricity to cities, towns and villages in the Hudson River counties. The incorporators are: J. C. Grier, S. P. Curtis and I. W. Day, 400 Park Avenue, New York City.

THE INTERNATIONAL PORT-O-PHONE SALES CORPORATION of New York, N. Y., has been incorporated by D. Wood, E. W. Seymour and C. C. Kelley, 115 Broadway, New York City. The company is capitalized at $100,000 and proposes to manufacture and deal in electric motors, machinery and appliances for defective hearing.

THE GARY & HOBART TRACTION COMPANY of Gary, Ind., has been incorporated by William Earle, Ora L. Wildermuth, Harlan Stratton, Grant Crumpacker and Adlai T. Ewing. The company is capitalized at $60,000 and proposes to construct and operate an electric railway between Gary, East Gary, New Chicago and Hobart, and also to supply electricity for lamps, heaters and motors in the cities just named.

THE LAMOKA ELECTRIC WATER POWER CORPORATION of Corning, N. Y., has been incorporated by J. Towner Hayt, Harry A. Erwin, George F. Showers and others, all of Corning. The company is capitalized at $100,000 and proposes to construct a dam near Savona, and a canal and pipe line from Wayne to Lake Keuka, on the west shore of which a power house will be erected between Grove Springs and Keuka, in New York State.

Trade Publications

ANCHORS.—W. N. Matthews & Brother, St. Louis, Mo., has issued an illustrated folder descriptive of its Scrulix Anchors.

CLIPS.—R. S. Mueller & Company, Cleveland, Ohio, has prepared an illustrated folder descriptive of its "Universal" test clip.

PLUGS AND RECEPTACLES.—"The Story of the Slots" is the title of a descriptive folder that Harvey Hubbell, Inc., of Bridgeport, Conn., is distributing.

ELECTRICAL SUPPLIES.—Charles G. Robin, Inc., 48 Warren Street, New York City, has recently prepared and is distributing its 1917 catalog on electrical supplies.

REFLECTORS. — "Imperial" flood-light projectors and "Imperial" reflectors are described in bulletin No. 302, issued by the Crouse-Hinds Company of Syracuse, N. Y.

RAILWAY ACCESSORIES.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., is distributing catalog 5-B, descriptive of its railway accessories.

LIGHTNING ARRESTERS. — Catalog 1-A, descriptive of lightning arresters, has been prepared by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa.

MOTORS.—The Eck Dynamo & Motor Company, Belleville, N. J., has issued bulletin No. 1000, descriptive of its Type D commutating-pole, constant-speed direct-current motors.

METERS. — Alternating-current watt-hour meters, single-phase and polyphase, are described in bulletin No. 46, recently prepared by the Sangamo Electric Company of Springfield, Ill.

REFLECTORS.—The Holophane Glass Company, Inc., of New York City is mailing a folder descriptive of its store-lighting campaign on the use of the new Holophane reflector-refractor units.

SWITCHBOARD ACCESSORIES.—The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., is distributing catalog 2-B, descriptive of its switchboard accessories.

HIGH-TENSION SWITCHES. — The K-P-F Electric Company, 37 Stevenson Street, San Francisco, Cal., has prepared an illustrated catalog descriptive of its high-tension pole-top switches.

ELECTRICAL SUPPLIES.—Clarence E. Edson of Cleveland, Ohio, is distributing a booklet descriptive of his line of electrical specialties, including heating pads, water heaters, ozone vaporizers, etc.

SWITCH PLATES. — Notwithstanding the complete information which is given in the catalog of the Bryant Electric Company of Bridgeport, Conn., it has been found that a great many architects do not find it convenient to make use of some of the information, particularly with reference to the over-all dimensions of flush switch plates. To facilitate the use of this information when necessary, the Bryant Electric Company has issued a special dimension sheet, which will enable any architect or architectural draftsman to readily place the switches on his plans.

New England States

CARIBOU, ME.—A bill has been passed by the State Legislature authorizing the town of Caribou to acquire the property of the Caribou Water, Light & Power Company.

ASHLAND, N. H.—At a special election held recently the proposal to purchase the property of the Ashland Electric Light Company was carried. The sum of $50,000 was appropriated. Of this $25,000 will be used for the purchase of the plant; $9,500 for an option on the property and water rights of the Asquam Lake Lumber Company, and the remainder for improvements to the electric-lighting plant.

SWANTON, VT.—The village of Swanton is building a new municipal power station to be equipped for an ultimate capacity of 4000 hp., the first unit to consist of an S. Morgan Smith 1250-hp. vertical water wheel directly connected to a 1125-kva. Electric Machinery three-phase, 60-cycle, 6600-volt generator. C. J. Parker is manager.

ASHBURNHAM, MASS.—Some extensions will be made to the municipal electric distribution system. A. F. Roy is manager.

HULL, MASS.—At a special election held recently the proposal to sell the equipment in the municipal electric plant at Nantasket Beach was carried.

WORCESTER, MASS.—The city of Worcester has appropriated $184,000 for street-lighting this year.

WORCESTER, MASS.—The Worcester Consolidated Street Railway Company is planning the reconstruction of its tracks and the installation of new feed wires on Front Street from Main to Harding Street, at a cost of about $30,000.

PROVIDENCE, R. I.—The State Legislature has passed the bill giving the Rhode Island Power Transportation Company State-wide domain for a period of ten years and the power to convey all its rights and property to any other concern.

PROVIDENCE, R. I.—The Board of Aldermen has passed an ordinance granting the Narragansett Electric Lighting Company permission to erect electric transmission lines along India Street and to string high-tension wires across certain other streets.

NEW HAVEN, CONN.—Plans for extension of the ornamental lighting system on several streets have been adopted by the lighting committee of the Board of Aldermen. About 50 new lamps will be erected.

Middle Atlantic States

AMSTERDAM, N. Y.—The City Council has granted the Adirondack Electric Power Corporation and the Edison Electric Light & Power Company an extension of time in which to place their wires underground.

ARGYLE, N. Y.—At an election held recently the proposal to install an electric-lighting system in Argyle was carried.

FREDONIA, N. Y.—The Niagara & Lake Erie Power Company has submitted a proposal to the Village Trustees for furnishing energy to operate the municipal street-lighting system.

GLOVERSVILLE, N. Y.—A new power plant will be erected at the mill owned by J. C. Bleyl, on West Center Street. The equipment will include a water-tube boiler, electric generator and steam turbine. Contracts, it is understood, have been placed for the machinery.

ITHACA, N. Y.—The Cayuga Power Corporation has been granted a franchise to supply electricity for lamps and motors in Freeville, and was also awarded a contract for street lighting.

LITTLE FALLS, N. Y.—The installation of a new street-lighting system in Little Falls is under consideration. It is proposed to substitute Mazda lamps for the arc lamps now in use. The Utica Gas & Electric Company furnishes electrical service here.

LONG ISLAND CITY, N. Y.—Bids will be received by the president of the borough of Queens, Queens Subway Building, Hunter's Point and Van Alst Avenues, Long Island City, until April 18 for construction of a temporary automatic electric pumping station at Thrall Avenue and Beaufort Avenue to Hatch Avenue. Plans, etc., may be seen at the above office. Maurice E. Connolly is president.

NIAGARA FALLS, N. Y.—Extensive improvements, involving an expenditure of $2,023,000, are contemplated by the International Railway Company during the present year. The work will include the construction of new roadways, reconstruction of others, new electric line or overhead system, new buildings and structures and power plant equipment.

PARISHVILLE, N. Y.—The local electric-light plant and water power sites, owned by the A. Sherman Lumber Company, has been purchased by Myron Roberts of Parishville. The new owner, it is reported, contemplates further development of the water power.

POTSDAM, N. Y.—It is reported that interests connected with the Aluminum Company of America, which took over the Hannawa Falls Power Company and the Northern Power Company, are considering the development of the water power on the Raquette River at Colton. The proposed project will include a dam, pipe line and power house, to cost about $375,000.

ROCKVILLE CENTRE, N. Y.—New equipment, including a 500-kw. General Electric turbo-generator and a barometric condenser is being installed in the municipal electric plant. H. C. Major is chief engineer.

SALAMANCA, N. Y.—The Water and Light Department is installing a 150-hp. engine and a 120-kw. generator in the municipal electric-light plant. H. E. Heller is superintendent.

SALAMANCA, N. Y.—Work will soon begin on the erection of new shops, power plant and storehouse of the Buffalo, Rochester & Pittsburgh Railway Company in Salamanca, involving an expenditure of about $300,000. The power plant will cost $90,000. A new coaling plant and transfer platforms may also be installed.

SYRACUSE, N. Y.—The Board of Supervisors is considering plans for the installation of new boilers, furnaces, water purifying apparatus and other new equipment at the penitentiary. C. H. Livingston is superintendent.

SYRACUSE, N. Y.—Extensions and improvements to its local system, involving an expenditure of about $500,000 are contemplated by the New York State Railways Company. The work will include extensions to its lines in different sections, new track work, new rolling stock, new electric equipment at the various power houses and substations.

ELIZABETH, N. J.—The Board of Works has awarded the Elizabethtown Gas Light Company a contract for street-lighting for a period of one year. The city expects to have perfected arrangements for the erection of a municipal electric plant at expiration of the contract.

NEWARK, N. J.—Plans are being considered by the Board of Freeholders of Essex, Hudson and Bergen Counties for the installation of flood light projectors on eight bridges over the Passaic and Hackensack Rivers.

NEWARK, N. J.—New boilers and accessory equipment will be installed at the Overbrook Hospital, at a cost of $59,928. The work will be in charge of the United Construction & Supply Company, 61 Broadway, New York, N. Y.

NEW BRUNSWICK, N. J.—The New Brunswick Power Company is constructing a tunnel, at a cost of about $50,000, from its power house at Union Street to the water's edge for the purpose of securing a larger supply of water for condensing purposes.

PATERSON, N. J.—The property owners on Market Street, from Main to Cross Street, have petitioned the Board of Works for the installation of an improved street-lighting system on that thoroughfare.

PERTH AMBOY, N. J.—The Citizens' Electric Light, Heat & Power Company, operated by the Public Service Electric Company, has commenced work on the installation of a new steam turbine at its Buckingham Avenue power station. Notice has been filed by the company of its intention of installing an underground conduit on High Street.

TRENTON, N. J.—A new power plant, to cost about $10,000, will be erected by the John A. Roebling's Sons Company on Canal Street to operate its wire plants.

TRENTON, N. J.—The Trenton Gas & Electric Company will erect two one-story additions at its plant on New York Avenue. A filtration plant, two stories high, will also be built by the company.

TRENTON, N. J.—Application has been made by the Eureka Power Company, a subsidiary of the New Jersey & Pennsylvania Traction Corporation of Trenton, for permission to erect a new pole transmission line and distributing system on the River Road to furnish electrical service in Titusville and Washington's Crossing.

WEEHAWKEN, N. J.—The Public Service Company has been awarded a contract for lighting the streets of Bergen Township for a period of five years.

ALLENTOWN, PA. — Application has been made to the Public Service Commission by the Lehigh Valley Transit Company for permission to issue $135,000 in bonds, the proceeds to be used for extensions and improvements to its system.

ALTOONA, PA.—The Pennsylvania Railroad Company is contemplating equipping its railroad for electrical operation from Altoona to Conemaugh, a distance of 25 miles.

ALTOONA, PA.—The Pennsylvania Hydro-Electric Company of Altoona has petitioned the Public Service Commission for permission to issue $36,000 in bonds for improvements and extensions to its plant.

EASTON, PA.—The Pennsylvania Utilities has petitioned the Public Service Commission for permission to issue $46,000 in bonds, the proceeds to be used for extensions and betterments.

EASTON, PA.—Bids will be received at the office of the county controller, Easton, until April 20 for construction of house of detention for the county of Northampton. Separate bids to be submitted on the building, heating, plumbing, and electric wiring and electric fixtures. George F. P. Young is county controller.

ERIE, PA.—Plans have been approved for the rebuilding of the State Street conduit for high-tension wires. William Crane is city electrician.

GILBERTON, PA.—The Philadelphia & Reading Coal & Iron Company is planning to install new electrically-operated pumping machinery for water and sewerage service.

HARRISBURG, PA.—Further improvements are contemplated by the Harrisburg Light & Power Company, including the installation of mechanical stokers, to cost about $100,000, and line extensions.

HAZLETON, PA.—The Cranberry Mines, operated by the Lehigh Coal & Navigation Company, will be equipped for electrical operation, at a cost of about $300,000. Electrically operated pumping machinery is now being installed.

MOUNT CARMEL, PA.—The Shamokin & Mount Carmel Transit Company is reported to be contemplating extending its railway from Centralia to Ringtown and thence to Shenandoah, a distance of about 14 miles.

NEW CASTLE, PA.—The New Castle Electric Company has petitioned the Public Service Commission for authority to issue $9,000 in bonds for improvements to its plant.

PHILADELPHIA, PA.—A new boiler bplant, one story high, and pumping station will be erected by the S. S. E. Company, 2300 Chestnut Street, at its factory at Erie Avenue and B Street.

PHILADELPHIA, PA.—The contract for electrical equipment for the new public library on the Parkway has been awarded to the Thompson-Starrett Company, 49 Wall Street, New York, N. Y., at $79,000. The heating and ventilating system will be installed by William M. Anderson of Philadelphia, at a cost of about $318,750.

PHILADELPHIA, PA. — Local extensions and improvements, to cost about $134,300, are contemplated by the Bell Telephone Company. It is planning to erect over 5000 ft. of new aerial lines and about 12,000 ft. of underground cables, to cost about $80,000. Extensions will also be made to its conduit system. Work has also begun on the erection of a two-story plant for the repair and operating departments on South Cameron Street, to cost $22,000.

PITTSBURGH, PA.—Application has been made to the Public Service Commission by the West Penn Railways Company for authority to issue $45,000 in bonds for extensions and improvements to its system.

POTTSVILLE, PA.—The installation of electrically operating loading machinery at its coal mines in northern Schuylkill County is under consideration by the Philadelphia & Reading Railroad Company.

READING, PA.—The City Council is considering the installation of a new fire-alarm signal to cost about $10,000.

READING, PA.—The Metropolitan Electric Company is contemplating the erection of a new electric transmission line from its local power station to Wernersville and vicinity to supply electricity for industrial purposes.

RUTHERFORD, PA.—Contract has been awarded by the Philadelphia & Reading Railroad Company to A. L. Carhart of Philadelphia, contractor, for construction of new

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

engine and power house at its local repair shops, to cost about $50,000.

RUTHERFORD, PA.—Bids are being asked by the Philadelphia & Reading Railroad Company for the construction of a new engine house and addition to power house at its repair shops in Rutherford. Samuel T. Wagner, Reading Terminal, Philadelphia, is engineer.

SHARON, PA. — The Harmony Electric Company, it is reported, is planning to supply electricity in the Shenango Valley. Application will be made by the Harmony Electric Company for six charters on April 16 to extend its lines into Sharon, Sharpsville, Farrell, Middlesex, Shenango and Hickory Townships.

STEELTON, PA.—Plans are being considered by the City Council for the installation of an underground conduit system on Front Street for placing all overhead wires underground. The Municipal League is interested in the project.

SUNBURY, PA.—The installation of an ornamental street-lighting system, using concrete or other standards is under consideration by the Northumberland County Gas & Electric Company.

WARREN, PA.—Plans are being considered for the erection of a factory building, 70 ft. by 150 ft., and boiler house for the Warren Mirror Works, to cost about $50,000. Bids, it is understood, will soon be asked by F. Grunniger, Wetmore Building.

WILMINGTON, DEL.—The Northern Central Power Company, operating electric and gas properties, has been taken over by the Electric Bond & Share Company of New York, N. Y., which contemplates extensions and improvements to the system.

FREDERICK, MD.—The Board of Aldermen has decided to purchase a new three-phase Westinghouse generator, to cost about $1,440, for the municipal electric-light plant.

SOLLERS POINT, MD.—The Aluminum Ore Company of East St. Louis, Ill., controlled by the Aluminum Company of America of Pittsburgh, Pa., it is reported, is building a branch plant at Sollers Point for the manufacture of anhydrate of aluminum from bauxite ore. The equipment of the power house will include four 1000-kw. generators and steam engines; boiler plant will be equipped with cross drum and marine type boilers, automatic stokers, mechanical boilers and overhead coal bunkers. The plans provide for the erection of one four-story, two three-story, two two-story and seven one-story buildings and open wood pier 400 ft. by 75 ft.

BLUEFIELD, W. VA.—The Appalachian Power Company is contemplating the erection of electric transmission lines between Norton and Esserville, Wise and several other towns.

WHEELING, W. VA.—Bids will be received at the office of the United States Engineer Office, Wheeling, until April 30 for construction of a fireproof power house at Dam No. 24, Ohio River. Further information may be obtained upon application to the above office.

DANVILLE, VA.—The Chesapeake & Potomac Telephone Company contemplates the erection of a telephone exchange in Danville, to cost about $150,000.

FARMVILLE, VA.—At an election to be held April 24 the proposal to issue $50,000 in bonds for improvements to the municipal electric-light plant, water-works system and street repairs will be submitted to the voters.

NORFOLK, VA.—The installation of a new street-lighting system is reported to be under consideration in Norfolk.

OCCOQUAN, VA.—Bids will be received at the office of the secretary of the Commissioners of the District of Columbia, Room 509, District Building, Washington, D. C., until April 16, for construction of a radial brick stack, furnishing and installing water-tube boilers and breaching, boiler feed pumps and feed-water heater at the District of Columbia workhouse and reformatory at Occoquan. Plans and specifications may be obtained at the office of the chief clerk, Engineer Department, District Building, Washington, D. C., upon deposit of $5.

RICHMOND, VA.—Plans are being prepared by the James River & Kanawha Power Company for the erection of a power plant at the falls of the James River, to cost about $250,000. As yet definite plans have not been decided upon. A. J. Bradley, P. O. Box 421, is president.

WASHINGTON, D. C.—The District of Columbia Paper Manufacturing Company, K and Potomac Streets, is planning to erect a power plant, to cost about $10,000, at 1037 Potomac Street.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 23 for two motor-driven hydraulic pumps and two accumulators at the navy yard, Norfolk, Va., and one motor-driven hydraulic pump and one accumulator at the navy yard at Philadelphia, Pa. Specifications (No. 2349) can be obtained on application to the above bureau or to the commandants of the navy yards named.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Various, Schedule 931—miscellaneous interior communication cable, miscellaneous telephone cable, miscellaneous portable telephone cord, miscellaneous antenna wire, bell wire, ignition wire, lighting and power wire, and miscellaneous single and double conductor wire. Brooklyn, N. Y., and Charleston, S. C., Schedule 931—miscellaneous lighting cable, Brooklyn, N. Y., and Mare Island, Cal. Schedule 927—furnishing and installing cork insulation on vessels. Brooklyn, N. Y., Schedule 930—60,000 ft. lead-sheathed cable, 180,000 ft. portable ship-lighting cable, 300,000 ft. incandescent lamp cord, 365,000 rubber-covered duplex wire, 175,000 ft. rubber-covered single wire, 60,000 ft. telephone wire. Washington, D. C., Schedule 911—two induction motors. Mare Island, Cal., and Puget Sound, Wash. Schedule 931—miscellaneous magnet wire. Boston, Mass., Schedule 916—one metal stock cutter, with automatic power feed. Charleston, S. C., Schedule 921—one upright drill. Portsmouth, N. H., and Puget Sound, Wash., and Brooklyn, N. Y., Schedules 928-914—19 motor-driven, bench type, 12 in. by 1¼ in. emery grinders. Portsmouth, N. H., Schedule 928—two motor-driven 12-in. saw tables. Applications for proposal blanks should designate the schedule desired by number.

North Central States

DETROIT, MICH.—Bids will be received at the United States Engineer Office, Detroit, until May 1 for furnishing electric cables and wire at Sault Ste. Marie.

DETROIT, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until April 27, for the installation of two new electric passenger elevators, etc., in the United States post office and court house, Detroit. Plans and specifications may be obtained at the above office.

IRONWOOD, MICH.—The installation of an ornamental lighting system in Ironwood is under consideration.

CANTON, OHIO.—Plans are being prepared by the Republic Stamping & Enameling Company for additions to its west side plant, involving an expenditure of about $500,000. Improvements contemplated will include a power plant and additions to stamping and other departments.

CINCINNATI, OHIO.—Plans have been prepared for an addition to the plant of the Fosdick Machine Tool Company, 50 ft. by 250 ft., one and two stories high. The company, it is reported, will install additional power plant equipment in the near future.

DAYTON, OHIO.—Bids will be received by Charles F. Brenner, president of Montgomery County Commissioners, until April 25 for lighting and power plant equipment for the Montgomery County Children's Home, Dayton.

EAST PALESTINE, OHIO.—The Youngstown & Sharon Street Railway Company of Youngstown is planning to extend its electric transmission line to East Palestine at once. The company has closed a contract with the East Palestine Rubber Company to supply energy to operate its new plant now under construction. The street railway line will be extended later.

HOLLOWAY, OHIO.—The construction of an electric railway in Harrison County from a point below Holloway to Jockey Hollow Field near Moorefield is under consideration. J. A. Bell, Oliver Building, Pittsburgh, Pa., is reported interested.

MILFORD, OHIO.—Plans have been submitted by the Cincinnati, Milford & Lockland Traction Company to the Commercial Club of Wilmington for extension of its system to that city.

OSGOOD, OHIO.—Plans are being prepared by the Lippincott Company of Cincinnati for the erection of a plant at Osgood. Equipment for power plant includes two 225-hp. boilers. The company manufactures catsup.

PIQUA, OHIO.—The Meteor Motor Car Company is considering increasing the output of its plant. Among the improvements contemplated is an addition to the power plant.

SALEM, OHIO.—The Water Works Department is contemplating the installation of electrically driven deep well pumps to replace the present compressed air-lift system.

TOLEDO, OHIO.—Arrangements have been made whereby the Toledo Railway & Light Company will extend its lines to all the additions in West Toledo to supply electricity for domestic use.

ADAIRVILLE, KY.—The installation of an electric-light plant in Adairville is reported to be under consideration. The Electric Equipment Company of Nashville, Tenn., is reported interested.

ASHLAND, KY.—Local citizens have pledged $50,000 in cash to aid the Vaughn Construction Company of Shawsville, Va., to construct an electric railway between Ashland and Russell.

BARBOURVILLE, KY.—The Barbourville Electric Light, Heat & Power Company is considering extending its transmission lines to Artemus.

GREENVILLE, KY.—Extensive improvements will be made to the local plant of the Kentucky Utilities Company, which will include overhauling the distribution system and the installation of electrically operated pumps at the water-works and ice plant.

SCOTTSVILLE, KY.—The name of the Scottsville Electric Light Company has been changed to the Scottsville Light & Power Company and the capital stock increased from $15,000 to $20,000. Improvements will be made to the plant.

DECATUR, IND.—The power plant of the Fort Wayne & Decatur Traction Company was recently destroyed by fire, causing a loss of about $50,000.

LAFAYETTE, IND.—The City Council is considering submitting to the voters at the coming municipal election the proposal to establish a municipal electric-light plant in Lafayette.

MUNCIE, IND.—A 12,500-kva., three-phase, 60-cycle, 2300-volt General Electric turbine is being installed in the municipal electric-light plant. W. O. Haymond is superintendent.

ONTARIO, IND.—The Cain Water Power & Light Company, recently organized with a capital stock of $75,000, to supply electricity for lamps and motors in Lagrange, Rome City, Wolcottville and Ontario, will develop a water power on the Pigeon River and erect a plant at Ontario and also another plant several miles out of the town. A. B. Cain of Ontario, William H. Cain of Butler, H. F. Cain of Mongo, and C. J. Cain of Buffalo, N. Y., are the incorporators.

WARSAW, IND.—A committee has been appointed by the City Council to secure estimates of the cost of the installation of a new lighting system.

CHICAGO, ILL.—Bids, it is reported, will soon be asked by the Commonwealth Edison Company, 72 West Adams Street, for alterations to substation. Von Holst & Fyfe, 72 West Randolph Street, are architects.

EVANSTON, ILL.—Bids will be received at the office of the commissioner of public works, City Hall, Evanston, until April 30 for furnishing and installing one 250-hp. water-tube, high-pressure boiler, including down-draft furnace of the Hawley type, boiler foundations, breeching, steam piping, etc., including the removal of the present water-tube boiler and also the resetting of one of the present boilers in a location to be designated by the city of Evanston. Plans and specifications are on file in the office of I. C. Brower, commissioner of public works.

LA SALLE, ILL.—The Chicago, Ottawa & Peoria Railway Company of Ottawa is remodeling and installing new equipment at its plant in La Salle, at a cost of about $200,000. This plant will be used as an auxiliary.

MILLEDGEVILLE, ILL.—Steps have been taken by local business men for the installation of an electric street-lighting system.

KNAPP, WIS.—The Wisconsin-Minnesota Power Company of Eau Claire is considering the extension of its electric transmission lines into Knapp.

LITTLE FALLS, WIS.—The Little Falls Water Power Company is reported to be contemplating extensions of its distributing lines into rural communities in this district.

MAIDEN ROCK, WIS.—Plans are being considered by the Wisconsin-Minnesota Light & Power Company of Eau Claire for the erection of an electric transmission line to Plum City and Maiden Rock.

FARWELL, MINN. — The Glenwood (Minn.) Electric Light, Heat & Power Company has been granted a franchise to install and operate an electric-light and power plant in Farwell.

ST. PAUL, MINN.—The St. Paul Gas Light Company contemplates the construc-

tion of a power station, 80 ft. by 140 ft., two stories high.

ST. PAUL, MINN.—Plans are being considered for the installation of an ornamental lighting system on Eighth Street, between Wabasha and Roberts, to cost about $4,132.

CENTERVILLE, IOWA.—The Iowa holdings of David G. Fisher & Company of Davenport have been consolidated with the Iowa Southern Utilities Company, with headquarters in Centerville. The Fisher properties taken over by the consolidation are the Leon Electric Company, Clearfield Electric Company, Blockton Light & Power Company and the Mount Ayr Light & Power Company. The Fisher companies now have about 25 miles of transmission lines under construction and an additional 75 miles was proposed in this year's budget. The entire development work contemplated this year by the merged companies will involve an expenditure of about $250,000.

MUSCATINE, IOWA.—Improvements to the ornamental street-lighting system are reported to be under consideration.

BUTLER, MO.—Plans are being considered for changing the system of the municipal electric-light plant from direct to alternating current.

EDITH, MO.—Plans are being prepared, it is reported, for the construction of a power plant on the Niangua River, near Edith, to cost about $4,000,000. C. F. Robertson and associates are interested.

SMITHVILLE, MO.—The local electric-light plant, owned by C. Morton and H. Gordon, was destroyed by fire on March 25, causing a loss of about $7,500. Electrical service is now supplied from the McComas water power plant at Edgerton. The local plant may be rebuilt.

ALEXANDRIA, S. D.—At an election to be held April 17 the proposal to issue $12,000 in bonds for extensions and improvements to municipal electric-light power plant will be submitted to the voters.

FULLERTON, NEB.—The Fullerton Electric Light & Power Company is contemplating the installation of a new gas engine and new generator. Additional equipment will also be installed in the water-works plant.

HUMPHREY, NEB.—The installation of a new oil engine and generator is contemplated by F. J. Huthmacher, owner of the local electric-light plant. The size of the units has not yet been decided upon.

MARQUETTE, NEB.—At an election held recently the proposal to sell the municipal electric light plant to the Public Service Company of York was carried.

WEST POINT, NEB.—The Nebraska Gas & Electric Company, which recently took over the property of the West Point Electric Light & Power Company, is contemplating changing the system from direct to alternating current.

YORK, NEB.—The Public Service Company is erecting an electric transmission line (33,000 volts) from York to Stromberg.

ABILENE, KAN.—The Riverside Light, Power & Gas Company is contemplating extending its transmission lines to Bennington.

PLEASANTON, KAN.—The installation of an electric-lighting system in Pleasanton is under consideration.

Southern States

MOREHEAD CITY, N. C.—The city of Morehead is installing a new municipal electric-light plant. C. Smith is superintendent.

RALEIGH, N. C.—The installation of an ornamental lighting system on Wilmington Street is under consideration.

CONWAY, S. C.—The Quattlebaum Light & Ice Company will soon install a new engine and generator in its plant. Orders, it is understood, have been placed for the new equipment. Paul Quattlebaum is president and manager.

BANNING, GA.—The Hutcheson Manufacturing Company is planning to add 2500 spindles to its mill and to build a dam to develop water power, and will also connect with the electric transmission system of the Georgia Power Company to furnish power during low-water periods or emergencies.

THOMASVILLE, GA.—At an election to be held April 27 the proposal to issue $160,000 in bonds for the installation of a fire alarm system, road work, etc., will be submitted to the voters.

ST. CLOUD, FLA.—The City Council is considering the question of establishing a municipal electric-light plant in St. Cloud.

WINTER HAVEN, FLA.—Contracts have been placed by the Winter Haven Water, Ice & Light Company for an additional 300-hp. Diesel engine and generator, to be installed by July, 1918, or before. W. A. Lyon is secretary and treasurer.

ALEXANDRIA, TENN.—Arrangements have been completed for the installation of an electric-lighting system in Alexandria.

TREZEVANT, TENN.—The City Council is considering calling an election to submit the proposal to issue $7,500 in bonds for the installation of an electric-light plant to the voters.

COLUMBIA, ALA.—The Columbia Power Company of Lexington, N. C., recently organized, is planning to construct a hydro-electric power plant on Omersee Creek, near Columbia, to develop about 700 hp., to supply electricity in Columbia, Ashford, Headland and Midland. J. Ed. Foy and Dermott Shemwell of Lexington, N. C., are interested.

GREENSBORO, ALA.—The electric plant and ice factory of the Greensboro Water & Light Company have been purchased by H. C. Armstrong, R. L. Ellis, Hugh Mallory and others. The new owners contemplate extensions and improvements to the property.

COLFAX, LA.—An agreement has been reached whereby the town of Colfax will take over the property of the Colfax Light & Power Company. The town is planning to double the output of the plant and install an elaborate street-lighting system. The proposal to issue bonds for the installation of a water-works system will be submitted to the voters. Xavier A. Kramer of Magnolia, Miss., is consulting engineer.

RAYNE, LA.—Bids will be received by the city of Rayne until April 23 for furnishing and installing machinery and equipment in connection with improvements to the municipal water and light plant. Copies of plans and specifications may be obtained at the office of Harold Raymond, Interstate Bank Building, New Orleans, or at the office of O. P. Bonn, Mayor, Rayne.

BUTLER, OKLA.—At an election held recently the proposal to issue $6,000 in bonds for the installation of an electric-light plant was carried.

CAPRON, OKLA.—The installation of an electric-lighting system is reported under consideration.

MARLOW, OKLA.—New equipment, including two Bruce-McBeth gas engines, one 100 hp. and one 150 hp., and a 187-kva., 2300-volt generator, is being installed in the municipal electric-light plant. L. A. Pritchett is superintendent.

RED ROCK, OKLA.—The city of Red Rock is contemplating the purchase of equipment for water-works system, including two triplex pumps, oil engines, etc. Plans and specifications are on file in the office of the Benham Engineering Company, Oklahoma City, Okla.

WOODWARD, OKLA.—The Woodward Cotton Company has submitted a proposal to the City Council offering to sell its electric plant to the city.

ALICE, TEX.—The Alice Ice & Light Company has awarded contract for erection of power house, 38 ft. by 50 ft., 22 ft. high, to A. E. Hinrichsen of the Alice Ideal Concrete Stone Company; also to install engine and electric apparatus.

WOODVILLE, TEX.—The Woodville Light & Power Company is contemplating the installation of an electric-light and power plant in Woodville.

Pacific and Mountain States

BREMERTON, WASH.—The County Commissioners have permitted the Mason County Power Company to erect electric transmission lines on the highways of the county to supply electricity to the navy yard and to various towns and villages in the county. The company has a power plant on the North Fork of the Snohomis River, near Hoodsport on Hoods Canal.

OTHELLO, WASH.—Steps, it is reported, will be taken by the Council toward equipping a municipal electric-light plant. Extensive improvements are also contemplated to the water-works system. The cost of the work is estimated at $14,000.

SEATTLE, WASH.—The city of Seattle has rescinded its call for bids for construction of an auxiliary unit to the Lake Union steam power plant. New bids will not be called until the question of issuing bonds for the plans has been definitely settled by the courts.

SEATTLE, WASH.—Plans have been approved by the Board of Public Works for a new hydroelectric power plant, to cost $3,000,000, for which bids will soon be asked by the city. The proposed plant will have an output of 13,000 continuous kw., 25,000 kw. for five hours and 10,000 kw. for the remaining 19 hours.

SEATTLE, WASH.—Plans have been completed and work will begin at once on the construction of a one-story addition to the municipal steam auxiliary power plant at Eastlake Avenue and Nelson Place, Lake Union, to cost between $75,000 and $80,000. Bids will be asked at once for driving 6000 ft. of piles for foundations, and considerable sheet steel piling for the coffer dam.

SPOKANE, WASH.—The Washington Water Power Company is considering the erection of a high-tension transmission line from its plant at Long Lake, 25 miles down the Spokane River to Northport. The proposed line if built will be about 90 miles long.

TACOMA, WASH.—Plans are being considered to double-track the extension line of the municipal street car system to the Todd plant. The cost is put at $75,000.

TWISP, WASH.—Extensions are contemplated to the local electric-light plant, including the installation of a larger water wheel and dynamo.

WAPATO, WASH.—The City Council has granted the Pacific Light & Power Company of Portland, Ore., a franchise to supply electricity for lamps and motors in Wapato for a period of 50 years.

SPRINGFIELD, ORE.—The Booth-Kelly Lumber Company is adding several new motors to its present installation. E. N. Willard is chief electrician.

ATWATER, CAL.—An election will soon be held to vote on the proposal to form highway lighting districts in the unincorporated towns and villages in the county.

BLYTHE, CAL.—Application has been filed with the State Railroad Commission by Floyd Brown for authority to install and operate an electric-light and power plant in Blythe.

LODI, CAL.—Steps have been taken by the Business Men's Association for the installation of an ornamental lighting system in the residence districts.

TWIN FALLS, IDAHO.—At an election to be held April 24 the proposal to issue $420,000 in bonds for installation and improvements to water supply and distribution system, reservoir and filtration plant, also for $176,000 in bonds for construction of a pipe line from Rock Creek to the reservoir of the present water system, will be submitted to the voters. In connection with the proposed water-works improvements a proposition is being considered which will provide both power and water for the city with a power plant costing $242,000 and a pumping plant to cost $350,000. At the proposed site at Clear Lake, 21 miles west of Twin Lake, it is estimated that 8000 hp. can be developed. The transmission line would be routed through Buhl and File.

GRANTSVILLE, UTAH.—Plans are being considered by a company represented by C. F. Anderson and J. P. Ericson, for the construction of a hydroelectric plant on North Willow Creek, to develop about 210 hp. Energy will be supplied mainly to the local potash plant and a number of mills in this vicinity.

GLOBE, ARIZ.—The City Council has granted E. Sultan a franchise to construct an electric railway on Broad Street. Plans are being considered to build an electric railway between Globe and Miami.

MESA, ARIZ.—The city of Mesa will purchase the electric and gas plants of the South Side Gas & Electric Company, at $113,000.

NOGALES, ARIZ.—Plans are being prepared for erecting lamps on Frank and Merley Avenues, Arroyo Boulevard and Park and Court Streets.

SHERIDAN, WYO. — Extensive improvements, including the installation of a 500-hp. boiler and a 5000-hp. surface condenser, will be made to the plant of the Sheridan County Electric Company. Extensions will also be made to the ash-conveying equipment. Orders have been placed for the machinery. The cost is estimated at $30,000.

Canada

CHAMPION, ALTA.—A lighting plant will be installed in connection with the proposed new opera house, which, it is understood, will furnish lighting service in the town. W. A. Carmichael is secretary and treasurer.

BLAKENEY, ONT.—Arthur Burgess of Carleton Place is reported to be considering a power development.

BRUSSELS, ONT.—A new hydro power project is under consideration by the town of Brussels.

KITCHENER, ONT.—The construction of an electric railway between Guelph and Kitchener is under consideration. The project, it is understood, is to be part of the proposed hydro-electric line.

TORONTO, ONT.—The Water Works Department is planning to install an additional pump and motor, to cost about $25,000, at the Riverdale pumping station.

SASKATOON, SASK.—Extensions to the municipal street railway, involving an expenditure of $19,640, have been authorized by the City Council.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until April 20 for furnishing steel rails, spring steel, electric cable and wire, conduit fittings, cable grips, pipe straps, electrical fittings, shop machines, chain blocks, duct rod, mica, soldering compound and salts. Blanks and general information relating to this circular (No. 1136) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York City; Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

14,282. Power Transmission System; William Morrison, Chicago, Ill. App. filed Sept. 9, 1916. (Reissue.) For use on automobiles.

1,221,013. Ventilating Plate and Spacer for Electrical Apparatus; Carl B. Auel, Wilkinsburg, Pa. App. filed Jan. 7, 1911. Employed in laminated magnetizable core structures for the purpose of providing ventilating passages or air ducts.

1,221,034. Oscillating-Current Generator; Lee De Forest, New York, N. Y. App. filed March 26, 1915. Circuit arrangement to cause intensification of the oscillating currents generated.

1,221,039. Flame-Arc Lamp and Electrode Therefor; Georg Egly, Berlin-Treptow, Germany. App. filed Nov. 26, 1915. Formation of slag on the negative electrode is prevented by incorporating salts of the alkalis in the negative electrode as an essential constituent evenly distributed throughout the entire mass thereof.

1,221,050. Circuit-Interrupting System; Albert L. Harvey, Wilkinsburg, Pa. App. filed Feb. 17, 1915. Interlocking devices for circuit interrupters.

1,221,061. Galvanic Cell; Morduch L. Kaplan, Brooklyn, N. Y. App. filed June 1, 1914. Consisting of a negative zinc electrode, a positive carbon electrode and an electrolyte containing ammonium chloride.

1,221,062. Galvanic Cell; Morduch L. Kaplan, Brooklyn, N. Y. App. filed Nov. 20, 1914. Leclanché type.

1,221,095. Means for Collectively Actuating and Controlling Alternating-Current Motors; Joseph L. Routin, Paris, France. App. filed March 26, 1915. Provides means for maintaining the synchronism between the receivers even when they operate in synchronism with an alternator, to render the speed of the receivers practically independent of the resistant couple.

1,221,106. Electric Water Heater; Emil Stranszky, New York, N. Y. App. filed Oct. 14, 1916. Heated water is adapted for use at a distant station, in which a local supply of water is maintained constantly heated and for use at the immediate heating station.

1,221,139. Apparatus and Method for Producing Metals of Improved Quality; Henry M. Chance, Philadelphia, Pa. App. filed June 12, 1916. Reduction of ore by fuel (i.e., the production of metal) and the refining of the metal by means of reactions induced or produced by an electric current are combined.

1,221,143. Automatic Weighing Scale; Samuel G. Crane, Toledo, Ohio. App. filed June 9, 1913. Pair of solenoids which act upon a common armature or movable core to which the poise is attached, whereby the latter is moved in one direction or the other according to which solenoid is in circuit.

1,221,175. Automatic Trap Nest; George A. Heatherbell, Deep Bay, Port Cygnet, Tasmania, Australia. App. filed Jan. 17, 1916. Improvements.

1,221,177. Selectively Operated System; Ralph N. Hill, New York, N. Y. App. filed March 21, 1914. Circuit at any particular location along a transmission line may be interrupted from a main or dispatching station without interfering with other portions of the line.

1,221,199. Ignition System; Robert McClenathen, Akron, Ohio. App. filed Feb. 13, 1913. Only the magneto is used, the operation of the engine being dependent upon the uninterrupted performance of the magneto.

1,221,200. Ignition System; Robert McClenathen, Akron, Ohio. App. filed Feb. 20, 1913. Improvements.

1,221,201. Electric Ignition System; Robert McClenathen, Akron, Ohio. App. filed Feb. 20, 1913. Control means used in connection with such systems.

1,221,206. Electrolyzing Apparatus; Rudolph J. J. Mueller, Sheboygan, Wis. App. filed Aug. 16, 1915. For producing hydrogen and oxygen from water.

1,221,208. Magneto; Alfons H. Neuland, San Francisco, Cal. App. filed Jan. 29, 1917. Used in connection with internal-combustion engines to generate the electric current for producing the firing spark.

Record of Electrical Patents

Notes on United States Patents issued on April 3, 1917.

1,221,232. Automatic Cut-Out; Joseph M. Sherman, Seattle, Wash. App. filed May 1, 1916. Improvement.

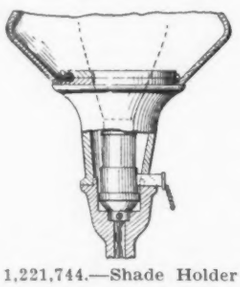
1,221,238. Phantom-Circuit Loading; James B. Speed, New York, N. Y. App. filed March 31, 1916. Improvements.

1,221,239. Electrical Connector; Charles E. Stahl and John F. Cavanagh, Meriden, Conn. App. filed June 20, 1916. Improved.

1,221,255. Connector Socket for Electric Lamps or the Like; Richard H. Welles, Kenosha, Wis. App. filed May 19, 1916. Bayonet type.

1,221,270. Thermo-Couple; Jacob W. Bard, Springfield, Ill. App. filed Jan. 30, 1914. For use in connection with mercury motor meters.

1,221,275. Cartridge Fuse; Warren F. Bleecker, Washington, Pa. App. filed Nov. 18, 1915. Readily adjusted for replacing a fuse without the use of tools.



1,221,744.—Shade Holder

1,221,308. Apparatus for Transmitting Impulses of Current in Electric Circuits; Charles L. Goodrum and Bert G. Dunham, Rochester, N. Y. App. filed Sept. 4, 1906. Device for controlling circuit contact members.

1,221,311. Apparatus for Obtaining Direct Currents from Alternating Currents; Leslie B. Graham, East Chicago, Ind. App. filed Oct. 7, 1915. Without any make-and-break in the alternating-current circuit and without objectionable sparking when rectifying high-potential currents.

1,221,327. Electrical Regulating Device; Gottlob Honold, Stuttgart, Germany. App. filed Nov. 13, 1913. Comprises a container holding a mass of finely divided resistance material, such as carbon.

1,221,345. Controller; William A. Marschke and Friedrich W. Marschke, Indianapolis, Ind. App. filed Dec. 24, 1915. Snap-switch action.

1,221,377. Signaling Mechanism; Henry E. Reeve, New York, N. Y. App. filed Nov. 8, 1913. Reduces the power required to rotate the hammer.

1,221,379. Sheep Shears Holder and Controller; Bert Ross, Idaho Falls, Idaho. App. filed May 2, 1916. Holder arranged so as automatically to shut off the power to the clippers when the latter are mounted thereon.

1,221,391. Feeding Device; Louis H. Thullen, Brooklyn, N. Y. App. filed May 20, 1915. Improvements.

1,221,418. Incandescent Light for Projection Apparatus; Emerson L. Clark, Lakewood, Ohio. App. filed Oct. 17, 1912. Incandescent filament.

1,221,443. System for Recording Meter Operations; Chester I. Hall, Fort Wayne, Ind. App. filed July 14, 1916. Mechanism for printing a record from the recording devices periodically by means of time-controlled apparatus.

1,221,451. Controller Device for Electric Lighting and Heating Purposes; Frederick H. Hoffman, Philadelphia, Pa. App. filed March 3, 1916. For controlling two sets of electric circuits.

1,221,486. Circuit Closer; Jesse W. Stutts, Florence, Ala. App. filed Feb. 24, 1916. Operated by a thermostat to complete an electric circuit to give warning or perform work when the temperature in the room in which it is placed rises above a predetermined degree.

1,221,499. Electric Switch; Paul H. Zimmer, Milwaukee, Wis. App. filed Nov. 6, 1911. Applicable to circuit breakers.

1,221,512. Electric Welding Apparatus; John P. Cluley, Green Bay, Wis.; App. filed Jan. 10, 1917. Attachment or tool to be used in conjunction with a welding machine of some standard type.

1,221,524. Extension Attachment for Testing Clips; Harry Frankel, New York, N. Y. App. filed April 20, 1916. Tests may be made in places now inaccessible.

1,221,527. Elevator Signal; Robert H. Gaylord, Pasadena, Cal. App. filed Oct. 26, 1915. Means whereby selective signals for different cars and for different directions of movement of the cars may be received on one and the same receiving device at a landing.

1,221,560. Electric Meter; Edwin H. Messiter, Brooklyn, N. Y. App. filed Aug. 12, 1913. Rotary type.

1,221,590. Indicating Electric Switch; Joseph Rado, Cleveland, Ohio. App. filed Jan. 11, 1917. Pilot lamp or signal in association with the switch which is automatically caused to light when the room becomes darkened.

1,221,607. Mount for Magneto Distributors; Emile J. J. Salmson, Billancourt, France. App. filed March 27, 1916. Ignition magnetos of internal-combustion engines.

1,221,609. Automatic Switch; Elmer H. Schwarz, New York, N. Y. App. filed May 27, 1912. Opens automatically upon the occurrence of overload or other abnormal conditions and can ordinarily be closed and opened at will without difficulty.

1,221,611. Locking Switch; Edson O. Sessions, Chicago, Ill. App. filed July 10, 1916. For use in connection with alternating currents of large capacity.

1,221,647. Electrode of Metallic Vapor Rectifiers or Other Apparatus; Albert Aichele, Baden, Switzerland. App. filed Jan. 19, 1914. Renders it possible to remove the heat from the anode in an effective manner without impairing the insulation.

1,221,652. Face Plate for Flush Receptacles; Harry U. Badeau, Bridgeport, Conn. App. filed Sept. 12, 1916. Stop device for limiting the movement of the door or shutter which normally obstructs the face-plate opening.

1,221,676. Pneumatically Operated Cam Controller; Frank E. Case, Schenectady, N. Y. App. filed June 11, 1915. Improved means whereby electric motors are started, stopped and generally controlled.

1,221,713. Spring-Fastening Device; Ernest B. Fahnestock, Brooklyn, N. Y. App. filed Oct. 4, 1911. For use in electrically connecting a plurality of conducting wires at a given point or location to an equal number of wires terminating at the same point.

1,221,744. Shade Holder; Herbert Kienzle, New York, N. Y. App. filed July 15, 1916. Direct arrangement for supporting a certain lamp shade or scarf or reflector in connection therewith.

1,221,780. Phototelegraphic Machine; George Wald, United States Army. App. filed Oct. 28, 1914. Method for transmission of photographs, sketches, etc., by wire, at a high rate of speed, locally or at a distance.

1,221,801. Selective Signaling System; John A. Hulit, Chicago, Ill. App. filed March 16, 1912. For telephone or telegraph lines.

1,221,812. Safety Oil Gage for Internal-Combustion Engines; John C. McMurray, East Boston, Mass. Improvement